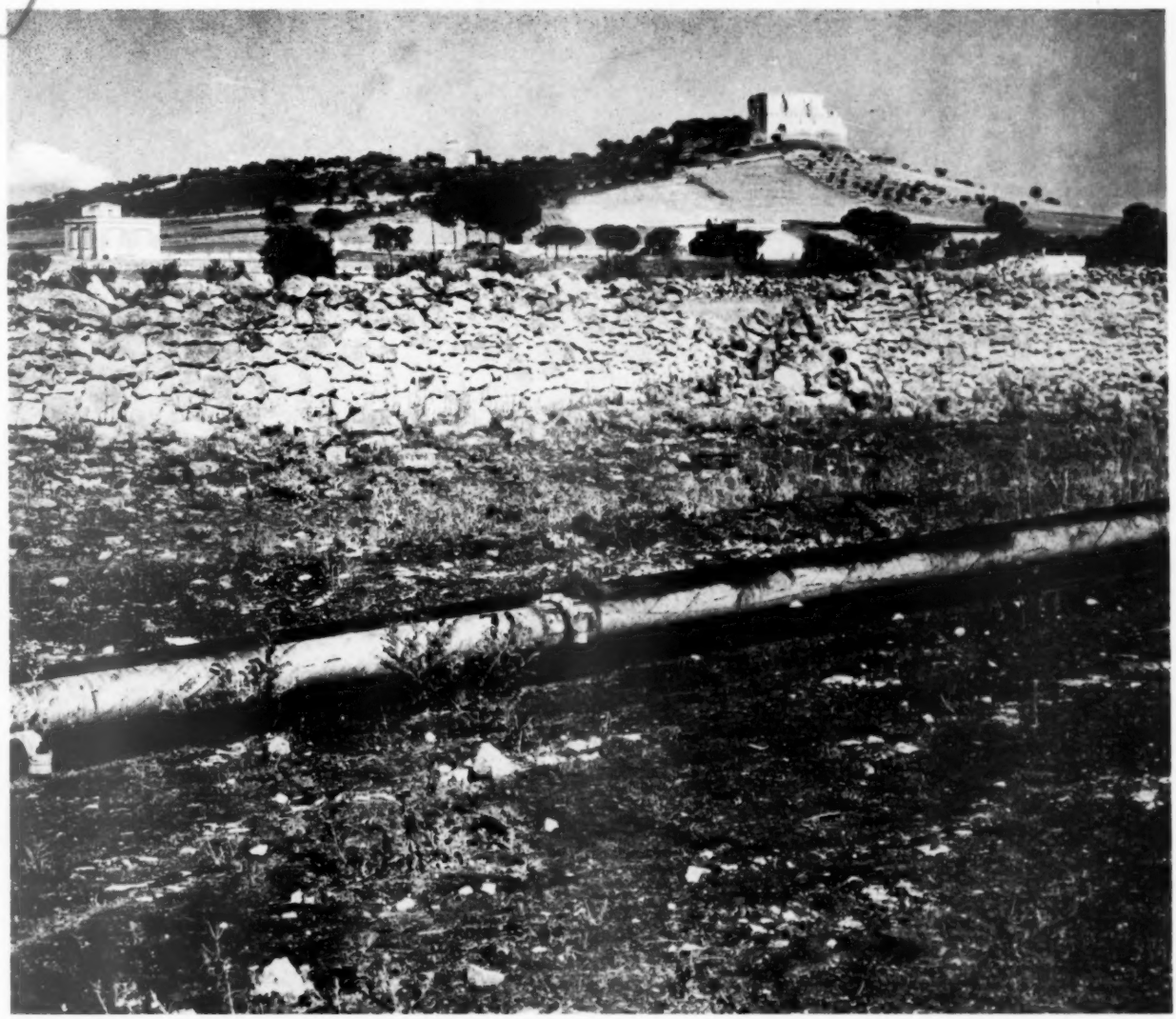
May 2, 1945

NATIONAL PETROLEUM NEWS

TECHNOLOGY DEPT.

Ancient Castle Stands Sentinel Over War Pipeline In Italy



Ruins of an old residence, it even might be called a castle, on the hill top overlooking the plains of southeastern Italy where Greeks and then Moslems ruled about 1000 years ago. In the foreground the three lengths of gasoline pipeline, with a telephone wire overhead, which has put the modern flying instrument of war into the air over these plains by the thousand at a time, where once charged horse and chariot.

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DETROIT

Yocom Writes on Pacific War, Platt on European: Washington bureau chief and NPN's editor give readers closeup of fighting oil on far-flung fronts. **See pages 4 and 5.**

Will Corn Products Basing Point Decision Affect Oil Prices? OPA officials doubt Group 3 and other pricing formulas will be upset by U. S. Court decision but have gone into a huddle on the possibilities. (Story includes full text of Robinson-Patman Act.) **See page 10.**

J. Howard Pew Addresses the Convention-in-Print: Sun Oil's president pays his respects to the postwar gloom prophets and starry-eyed "planners." **Page 16.**

MORRISON BROS. CO.

1855 *90th Birthday* 1945

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and . .

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OUR 90 YEARS IN BUSINESS IS YOUR ASSURANCE OF THE BEST IN OIL EQUIPMENT

DRAW THE LINE
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BUY WAR BONDS TODAY
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MORRISON BROS. COMPANY

OIL EQUIPMENT HEADQUARTERS

DUBUQUE, IOWA

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It was transportation that changed the nation's living habits after World War I. New industries mushroomed; Tourists' camps; road building; country clubs; truck freight. Other industries withered and died: Wagons, harnesses; blacksmiths.

Post World War II era will also bring changes. And with these changes will come new living habits, new opportunities in life, new roads for profit, a new era in the history of transportation — and petroleum.

Now being developed in the petroleum industry, are gasoline and fuels for more speed, more power, more efficiency — producing miracles for America in war — later to take a natural place in normal American life. Republic will pass the benefits of these developments on to the public through its dealers and jobbers. It's wise to work with Republic.

REPUBLIC'S GOING PLACES

REPUBLIC OIL COMPANY

Benedum Trees Building

Pittsburgh, Pennsylvania

V. M. Razzano

R. A. Youngblood

Hope To Snip Red Tape in 'Gas' Rationing

Richard A. Youngblood should make a good gasoline rationing chief for OPA —and the industry—for he's almost as disgusted with over-complicated regulations as the industry is.

But more than that, his strong right-arm in administering the gasoline rationing program will be **Vincent M. Razzano**, of Socony-Vacuum, now on leave of absence, who has rolled up 13 years of gasoline marketing experience.

Mr. Youngblood succeeds Quentin W. Regestein, who has returned to Socony-Vacuum as division manager in charge of the New York City Division, and under whom he gained a fast-growing "savvy" of what makes the distribution and marketing end of the oil industry tick.

As an indication of "Dick" Youngblood's attitude regarding over-burdensome rules on gasoline rationing, he and Mr. Razzano are now spending every spare minute to develop a program for restoring dealers' inventories that are in a wasted condition throughout the country. When they come up with an answer, they'll hash it over with the industry committee on gasoline rationing, and it's a good bet that their program will work and will be understandable and simple for the industry to use.

Mr. Youngblood joined OPA in March 1942, and has served in the gasoline rationing branch in various planning and administrative capacities for the last three years. For a period of nine years before his government service, he was engaged in merchandising and distribution in the appliance industry, with headquarters at Chicago and Philadelphia. He is a native of Freeport, Ill., and now resides in Silver Springs, Md., with his wife and two young sons. He emphasizes that he is as anxious as any government employe to return to private industry.

"The problems of industry under rationing," he says, "are one of the most important considerations in the program that must be worked out. Already, we have assigned men in Washington and the field to work specifically on ways and means of making industry's responsibilities under gasoline rationing more simple to discharge.

"For one thing, we need simpler forms and procedures, especially those revolving around replenishment of inventories and the bail-out program. I hope that when Mr. Razzano gets his feet on the ground, he will be able to spend a good deal of his time outside of Washington to improve our relations with the industry.

"We intend to expand our so-called trade co-operative groups—our industry committee set-up—in number and activity. In short, instead of operating with OPA and the industry on opposite sides of the fence, we are going to try to tear that fence down."

Mr. Razzano shares the industry's feelings regarding multi-page forms, regulations, standards, et al, and already has the cleaver out to slice down the complexities, which he believes are unnecessary in many cases.

Born in Brooklyn, N. Y., he has spent most of his life on Long Island, attending school there and later Syracuse University from which he was graduated in 1931. Shortly after—in 1932—he got his first taste of oil, running a service station for Socony-Vacuum. During the time since, he has risen from that job to station supervisor, marketing assistant and finally acting district manager for the Long Island district.

"There's a lot more to OPA operations than I had realized," he remarks. "It's too bad the industry isn't more familiar with all of the difficulties involved on the government side of the program. It might be more amenable to it. But, it's true that the straitjacket is too tight and I'm going to try to loosen it up, in a manner that is as reasonable and satisfactory to everyone as I can make it."

INDEX

Coming Meetings	47
Eastern Rail Hauls	30
Markets	49
NPN Oil Convention-in-Print	16
Oil Prices	51
Oil Transportation	30
Personals	56
Pipelines	8
Warren Platt in Italy	5
Production News	34
Refining News	24
Statistics	50
War-Oil Orders	40
Washington News	10
Yocom in the Pacific	4

BULLETINS

J. C. PEW WINS HANLON AWARD

TULSA — This year's recipient of the Hanlon award, highest honor in the natural gasoline industry, was conferred May 2 on James E. Pew, director, Natural Gas-Natural Gasoline Division, PAW, by the Natural Gasoline Assn. of America. Presentation, by N. G. A. A. President J. W. Vaiden, Skelly Oil Co., Tulsa, took place at the annual meeting of the association's board of diirectors at Dallas, a meeting held in lieu of the usual national convention.

Mr. Pew is the ninth recipient of the Hanlon Award, conferred annually by N. G. A. A. for outstanding meritorious service to the natural gasoline and condensate industries.

PAW OFFICIALS IN LONDON

WASHINGTON—PAW Deputy Davies reports that three PAW officials have arrived in London to represent the U. S. oil agency at a month-long session of the United Nations petroleum supply program meeting which opened May 1.

The PAW officials are Jerry A. Cogan, C. Marvin Case, and Frank P. Donohue.

SUBSIDY BILL REPORTED

WASHINGTON — House Banking and Currency Committee on May 1 favorably reported Subsidy Bill, S. 502, to the House, but rejected a suggestion made by Gordon Duke, Southeastern Oil, regarding oil subsidy payments. (See earlier story, p. 12.)

FAVOR PIPELINE ACT EXTENSION

WASHINGTON — The House Interstate and Foreign Commerce Committee on May 1 favorably reported to the House H. R. 2600, which would extend the life of the Cole Pipeline Act until June 30, 1947. The act is due to expire on June 30, 1945.

NATIONAL PETROLEUM NEWS—May 2, 1945—Vol. XXXVII—No. 18. Published every week at 1213 West 3rd St., Cleveland 13, Ohio, U. S. A. Subscription rate $5.00 per year in United States, Mexico, and Pan-American countries; $6.50 Canada and foreign countries. Entered as second class matter Jan. 17, 1910 at Cleveland, O., post office under act of March 3, 1879, by The National Petroleum Publishing Co.

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PETROLEUM NEWS
NPN
NEWSMAGAZINE FOR OIL MANAGEMENT MEN

Platt Explains Why Supplies Will Be Tight For Civilians After V-E Day

By Warren C. Platt, Editor

WASHINGTON, D. C.—While the German war is about over, oil supply experts here are unable to figure anything but a continuing tight supply situation on petroleum products.

Popular opinion, including that in the oil industry, is that, of course, the end of the German war will release a lot of petroleum products, especially for civilian use. As published in NPN last week, PAW thinks that as much as 100,000 barrels a day may be freed for American motorists. Further figuring, however, indicates that while there will undoubtedly be a reduction in the war consumption of motor grade gasoline, it may be a question as to how much of that saving will appear on the domestic markets in the U. S. because the long haul from the Far Pacific and the greatly accelerated pace of the war against the Japs will call for greatly increased supplies.

Experts, who have been frantically working on recasting their supply and demand figures, are now predicting that however the motor gasoline supply may come out there will have to be a most substantial increase in the crude oil supply to take care of the big increase in the consumption of heavy fuel oil, Diesel oil, and especially aviation gasolines.

Extra Crude May Come From Venezuela, Middle East

Where this extra crude oil will come from and what refineries will turn it into products is also a serious problem. Chances are, as it will be needed quickly, it will be moved from Venezuela and the Middle East because this country's production, from its present wells, is figured to be even past the maximum of efficient output. Higher prices, more drilling equipment and a radical reduction in the Army's revised drafting of oil industry trained men, heretofore exempted, will have to be brought about before any material increase in American production can be figured on, say these experts.

This surprising turn in oil demand was indicated to the members of the P.I.W.C. at their last meeting here and they could not believe it. To them and to the average man the ending of the war with Germany and stopping of a large part of the big consumption of petroleum products there, would seem to assure surplus petroleum supplies for the rest of the world.

But there are some factors affecting supply that have not been appreciated as the European war held the bulk of our attention and consumed a very large part of our petroleum and other supplies. Here are some of these other factors:

Everything the military forces have everywhere will be thrown into the fight against Japan to end it as soon as possible. Every man and all supplies that can be used against Japan will be moved from the European theater as fast as possible.

The fight against Japan will have to be carried on over two and three times as much sea on which ships will be kept operating at maximum speed and making more miles per month because of fewer turn-arounds in a year. There will be a greater demand for heavy fuel than heretofore.

For the same reasons all the Diesel oil consuming equipment will see more service in miles per month and will step up the consumption considerably. Much of that equipment has been on short hauls, with time lost on turn-arounds and some even tied up when the European war went more to land operations.

More Big Planes Likely To Be in Action With New Types Also Forecast

The increased demand for aviation gasoline will tend to reduce the refinery production of satisfactory grades of some of the other products. Until one sees some of the big bomber airfields in operation in Europe, one has difficulty appreciating the great extent of their activity and the volume of gasoline they consume in a day. Perhaps now that Germany is through the censors will release some of those figures, but I have seen field areas where a fair sized tanker cannot fill one day's demand when the weather is good. One day a few weeks ago the London radio said that 7600 planes were in the air over Germany in the previous 24-hour period.

Presumably also more big planes will be in operation even though Henry Ford's Willow Run Plant will soon shut down. Our peak use of planes is still before us. There also are reports of new type planes including the jet planes which are great consumers of a distillate type fuel.

More oil supplies will be given for essential civilian use in Europe but the experts here assure one most firmly that those supplies will not be sufficient for any private or unimportant use. But more motor fuel will have to be provided for farming and trucking, to get food grown and moved to market and to get foreign industry started up so the people can be self-supporting. The planting and growing season is now here and full advantage must be taken of it to avoid a continued heavy drain on the food supplies of the rest of the world next fall and winter.

Men here believe that the oil industry, for probably the rest of this year, will find itself confronted with the biggest task so far of the war—that of getting this additional crude, moving it to refineries and then putting it through present plants. Little if any more steel will be allowed for new construction even were there time for that. The picture herewith presented is based on estimates made by conservative experts with plenty of facts at their command but they are still only estimates and therefore are subject to adjustment but men who are doing this figuring do not believe that the estimates should be discounted much at the present time.

With Herbert Yocom in the Pacific—

12,500,000 Bbls. of Products Consumed In 'Typical' Month of War Against Japs

Figures are for Black Oils, Diesel Fuel, Aviation and Other Gasoline, Exclusive of Drum Shipments, NPN Writer Reports

By Herbert A. Yocom

PACIFIC FLEET HEADQUARTERS —They are fighting two wars out here—one against the Japs and the other against distances so great that after you yourself have spanned them you marvel that American forces have come so far in so short a time.

Mr. Yocom

Realize that fact—that there are TWO WARS — and only then can you begin to really appreciate why it is that there's going to be a tremendous amount of oil consumed in the Pacific between now and what they refer to back in Washington as V-J Day.

Everyone with whom I have talked emphasizes that point again and again.

In the past year alone, consumption of black oils probably has increased 250%. Use of avgas easily has tripled. So has the demand for Diesel oil, while requirements for motor fuel—both 80-octane all-purpose and regular—have increased six-fold.

What the estimated requirements are for six months from now or even a year hence cannot be revealed, but they are of such magnitude that they would not seem to justify a feeling on the part of the oil industry that the end of the German war will afford opportunity for a breathing spell.

Fuel the Key to Distance, Says Navy Supply Officer

Neither do they warrant optimism on the part of the American public that V-E Day will bring with it more than just a temporary slight increase in gasoline rations. (*See Platt article, p. 3*)

These latter two are the dominant impressions gained during the course of an 8800-mile, four-hop flight from Washington in one of the Navy's big Liberator bombers—a converted, four-engined job powered by 100-octane. From the time our plane lifted from National Airport until the wheels touched the ground here on Guam, we were in the air, all told, just 42 hours and 29 minutes.

At every stop I talked with Navy men, many of them recently from the Industry and every one profoundly impressed with the magnitude of the task that lies ahead.

"Fuel is the key to distance," Rear Admiral J. J. Gaffney, Supply Officer for the 14th Naval District, told me at Pearl Harbor.

"It has become the crucial item in this (Pacific) war," he aded. "It used to be, as Admiral Nimitz once said, that the order of importance in supply was beans, bullets and oil. Now it's oil, bullets and beans. Oil is the No. 1 fundamental."

And here on Guam there was Brig. Gen. Herman Feldman, Deputy Chief of Staff for Logistics at CINCPAC, who thought he knew something about supply problems after serving in Africa and Europe but discovered on coming to the Central Pacific that he had "only scratched the surface."

No Lack of Fuel So Far Despite Stupendous Demands

Gen. Feldman is the officer responsible to Fleet Admiral Chester W. Nimitz for determining whether any particular proposed operation is logistically sound and supportable. As such, he is in position to know whereof he speaks when he states that "As we get into the larger mass operations, these figures (as to past petroleum requirements) will be dimmed by what is already planned for use."

The figures mentioned by the general are those showing deliveries of petroleum products to the fleet and to both Army and Navy shore installations in this area during a recent "typical" month's operations. They indicate that the fleet alone used 8,000,000 bbls. of black oils and 1,500,000 bbls. of Diesel fuel in that month. In addition, 2,500,000 bbls. of avgas, 500,000 bbls. of mogas and 450,000 drums of miscellaneous products were delivered and consumed.

So far, at least, there has been no apparent lack of oil in the Pacific. On that score, listen to the words of Capt. Phillip D. Lohman, the Area Petroleum Officer and representative of the Army-Navy Petroleum Board who has responsibility for all bulk fuels and packaged products and who controls all merchant tankers for delivery to the forward area:

"We have (he asserts) never kept a ship from sailing because of lack of fuel."

This is not to say, however, that there have not been times when the Area Petroleum Officer and his uniformed aides from industry have not had to scratch and hump to maintain that proud record. Far from it, according to Capt. Lohman's top assistant—Commander J. C. Shepherd, an expert "numbers man" who had spent 13 years in the Research Department of Union Oil Co. before being called to active duty in 1940.

The Pacific is so huge, the supply lines so extended, Commander Shepherd reminds you, that the whole operation of fueling the ships of the fleet, the hundreds of supply vessels, the rapidly expanding shore bases and our great air forces almost requires one to be an expert at tight-rope walking.

While this story is being written on Guam, close up behind the forward area, the real "nerve center" of petroleum supply for the Pacific is back at Pearl Harbor, where Capt. Lohman holds forth.

APO-Pearl is the hand that directs and controls the westward flow of oil to all parts of the Pacific theater, with the exception of that area for which Gen. Douglas MacArthur is alone responsible. APO's job is to precompute statistically, as closely as possible, the utilization of oil throughout all of this great ocean and then to see to it that the necessary amounts are laid down as scheduled. Computations are reduced to a fine point, even involving estimates as to the fuel requirements of individual ships and of individual planes.

Weekly checks are made on the inven-

(*Continued on p. 45*)

Yocom Writes From Guam, Platt from Italy on War

Herbert A. Yocom, chief of NPN's Washington news bureau, contributes his first article on the oil industry's part in the war against Japan in this issue.

As a correspondent accredited to the Navy, Mr. Yocom writes from Guam and confirms at first hand the predictions of U. S. officials and military leaders of the staggering quantities of petroleum products that are being used in this war against a cruel enemy and of the even greater amounts that will be needed to bring final victory.

On the opposite page, NPN's editor, Warren C. Platt, contributes another article from Italy, one of a series dating back nine months in which he has covered the oil angles of the fighting on all the European fronts.

And so, this week, NPN gives its readers a continuing story of fighting oil on a global basis. Mr. Platt has prepared a number of additional articles on the European phase which will appear in subsequent issues and Mr. Yocom's despatches should be coming in regularly during the next few weeks.

For the complete story of oil at war, readers should not miss a single one of these reports.

With Warren Platt in Italy—

Pol Men Kept Accurate Record of Costs in Building Tanks and Pipelines Under Fire

561,700 Bbls. of Steel Storage Capacity Rehabilitated in Naples Area in 30 Days for Trifle More than 28c a Bbl.

By Warren C. Platt

NAPLES, Italy—This story is being written in a villa, high on the mountain shore of the truly beautiful bay of Naples. The sun does not happen to be shining today in its warm and much-advertised Neapolitan splendor, but it has so shone for the last few days, much to everyone's relief from a cold and wet winter in heatless villas and offices.

Mr. Platt

This story is really about an equally peaceful set of facts seemingly—the construction of tanks and pipelines to flow the most peaceful and pleasure-giving product of the whole world, gasoline—facts picked from the report of an oil engineer and made to the U.S. Army.

True, these particular tanks have been destroyed by war but the engineer's facts bring them back to present prewar status. Perhaps also the pipelines will be used for peaceful means when this war is over. At all events, nowhere in this engineer's report made by a Texas oil man, by the way, is there the sound of a single bomb or shell. It is all pipe and fittings and man-hours and such.

But the report's hard statistical facts are in great contrast to the days that prompted them. As one sits here amid reasonable heated comfort and in quiet and peace, with the street laughing with children, one cannot help but think of the turmoil and bombing and shell blasting of the days just a year ago which created the facts of this engineer's report.

Reunioneers Recall Night in 'Jug' After 'Spy' Episode

Right here in Naples, yes out around the point of this beautiful bluff that overlooks the bay, there was banging and whamming night after night and sometimes day after day, for most of this previous winter. The disturbance reverberated about this particular villa, as well as the whole Neapolitan area. It blew out all the windows and brought the oil men living here downstairs in whatever they had on or could grab, including their steel helmets.

Then they would stand, hours at a time with backs against the stone wall of the villa in anxious hope that the three-inch slab of concrete that is the roof of the veranda would count for something against the falling debris, bomb fragments and the always heavy shower of ack-ack.

I picked up this engineer's statistical report yesterday to glean a few hard facts for a dry recital of how war blasted tanks are reconstructed and how war gasoline pipelines are built, how many man-hours, pounds of welding rod, dollars and steel it takes.

But as I read its brittle facts, I saw them against a picture which had just been painted, quite unintentionally, at lunch yesterday noon by a former Standard Oil manager for Italy and two War Shipping men, all of whom lived in this country before the war and went through its bombings. In fact the old Standard Oil foreign representative was one of the group of oil men who came to Naples when it fell and because of his former company connections, rented this villa from the former Neapolitan Standard Oil manager whose family the war had separated.

Yesterday's lunch was the first reunion of the Standard Oil man and a former shipping buddy since they had spent a night in the Genoese "jug", and a dirty one it was, because the maid of one had flashed a flash lamp into the brush of a terrace below their garden thinking she heard chicken thieves.

Story Sounds Funny Now, But It Could Have Been Tragic

Whoever was down there she never learned but, as this happened to be the second night of the official blackout after Benito declared war on England, the gendarmerie hotfooted it over, called her a spy who was signalling the enemy where to drop his bombs and charged the S. O. man and his ex-shipping companion with being accomplices. And, of course, just as they were going strong with their disclaimers the enemy did come over and gave that particular area a whale of a plastering which scared the uniformed Italianos half to death and made their fingers twitch all the more suggestively on their carbines.

The reunioneers told their respective stories with gusto and finally with much humor. However, they reminded you that no matter how funny it now sounded it was not funny then because, in those exciting days, it was a tossup whether the overwrought officials would shoot them in the nearest dark alley. That story brought on tales of the bombings around this villa, tales that made you hear the wham, whamming, especially as some ack-ack guns down the hillside practiced a salute or two as the luncheon ended.

The Characters in This Story of Bombs on Oil Men in Naples Area

The Standard Oil Italian Representative—
David H. West, son of a newspaper man and lawyer of Columbus, O., for years in Esso foreign service, mostly in Italy as executive assistant to the managing director, and during this war civilian oil advisor to the POL section of all "Med" military operations.

The Old Sea Captain—
Capt. Alfred R. Steinmuller, 29 years at sea, mostly as skipper for Standard of New Jersey tankers, lately Esso pilot at Port of Houston and for two years tanker captain for AFHq at various "Med" ports.

The Oil City Man Who Misread the Town Sign—
Lieut. Col. John L. King, former sales manager of Pennzoil and with the Civil Affairs part of POL of AFHq.

The Assistant Pompeii-Discovering Oil Engineer—
Maj. Larry Grunder, late of the technical department of Richfield Oil at Los Angeles, and now of the Technical Section, POL of AFHq.

There was a further touch to the picture of a year ago just this noon. The old Standard Oil sea captain, who has been port tanker officer at half a dozen "Med" ports during this war, stopped by for his noon "mess." He lives here and came up from town on his way to dock a newly arrived tanker at a small port just over the hill, a port that got a particular lot of whamming a year ago.

The sea captain was sucking his pipe and quietly waiting for the noon news broadcast, when I asked about the doings of a year ago. He mildly admitted that he lived here then, had moved in from Algiers with the first and that there had been "a hell of a racket about here." In fact, he said, the villa seemed to be on the line of flight of the enemy bombers so that while they never hit it they spilled a lot of bombs and noise all around it for so many nights of so many months in that winter of 1943-44 that "you just turned over and kept on sleeping."

And from all the testimony of the almost monotony of continued bombing for months on end, which finally convinces you that none have "your number on it", one can well believe this testimony, especially when it is about men who have worked all day long and maybe half the

Lieut. Col. John L. King . . . . he misread a sign, thought he had discovered a modern Pompeii

night to repair the damage and to get vital fuel on to the war front, as had the oil men in this villa and elsewhere in this much blasted country.

Keep the Bombings in Mind as Engineering Facts Are Studied

So when the reader far-off and, so far, in safe America, reads this engineering dope to find out what kind of a job this rehabilitation of bunged up oil refineries is, and this construction of war gasoline pipelines also is like, will that reader also please listen to an obligato of the eternal wham-wham-wham-BANG of the days, and particularly the nights, when the work this engineer reports on, was being done?

Let the reader remember this whamming was not just distant reverberation to the ears of these men, not only in this villa but to the whole oil crowd over here, but that frequently it was accompanied by falling rock and dirt and brick, by the crushing rush of blasting air, and always there was a continual shower of head-piercing ack-ack from the anti-aircraft guns that simply littered every flat spot around this beautiful, and once peaceful, bay.

To add a final touch of higher red color to this pyrotechnical show that outdid any Fourth-of-July display they ever saw, the Americans said, old Mount Vesuvius, which stands across the bay from the bluff where sits this villa, let go at the same time.

The Americans say they stood in admiring awe, at the combined show of flaming volcano and soaring ack-ack and bursting bombs and burning flares descending from the heavens. Sometimes they were in pajamas when caught in bed, sometimes in full uniform but always in their tin helmets. But see the show they did.

Now one final human interest touch to this introduction to this engineering discussion. Two residents of this villa, one an old oil man from Oil City, Pa. and another, an oil engineer from Los Angeles, went exploring up the side of the exploding Vesuvius late one afternoon. They pushed along in their jeep right to the edge of the flowing lava and there seemed to discover the remains of a town. They investigated and returned full of excitement and much information, geological, metereological, alimentary and otherwise.

One rattled off the joint account of the scientific expedition—that they had been so high up on the mountain and observed this and that; that they reached a town disappearing in the volcanic debris, a town whose name was—and the Oil Man from Oil City carefully read it out of his notebook, because, he said, it was about to be THE historic town that would be the Pompeii of this century so he wanted to have it correct. It was on a sign board at the entrance of the town.

He spelled the name out carefully.

How U.S. Oil Men and Engineers Rehabilitated the Naples Area

The gang roared because it is the name of the best advertised and most widely used cathartic in all Italy, while the name of the town, which they missed somehow, was that of a saint.

The roar of laughter was drowned by another lot of bombs that came whamming down, some within a few hundred yards. The crowd took to tin hats and the front porch. Fortunately for them these bombs exploded way down the bluff, at the water's edge below the villa.

So with this perhaps unorthodox setting for an otherwise perfectly conservative and sound engineering report, will the reader please keep the offstage business vividly ringing in his ears as his mind garners the facts about oil country construction work. That is the only way a full appreciation of these facts, and the kind of a grand job these brother oil men are doing over here, can be had.

Two months before Naples was captured plans had been completed by the POL men of the "Med" area, both on the general staff of Col. Gustave H. Vogel and in the Engineering Corps that had to do the work, as to just what had to be done to make the various oil installations at Naples available to the U.S. Army as soon as possible.

The planners knew in detail just what the installations were at Naples and thereabouts for among the planners were men from the oil companies that owned and operated the installations before the war. From Army Intelligence and some private sources, they had information as to the extent of the damage done by war.

While the damage to each piece of equipment was not known; nor could be known until the enemy had finally been driven out, general assumptions were made on which the number of men and amount of material needed for rebuilding could be estimated. It was surprising how close those assumptions came to the facts. The assumption was that 90% of the oil installations would be destroyed when the Army took over and that turned out to be true.

An Engineer Petroleum Distribution Company, one experienced in oil plant construction, was first sent into the plants in the Naples area and in 30 days they had rehabilitated 561,700 bbls. of steel storage, with aid of 338 civilians, and at a cost of a little more than 28c per bbl. of storage capacity.

1,671,700 Barrels of Storage Are Repaired in Five Months

In this work 11 oxy-acetylene and six electric welding machines were employed using 8250 lbs. of electrode, 2700 lbs. of steel rod, 330 bottles of acetylene and 510 bottles of oxygen.

When the enemy departed from Naples a party of oil engineers moved in, arriving Oct. 2, 1943. They were headed by Maj. Charles B. Gholson, then captain of an Engineer POL Company, drilling contractor from Texas and pioneer oil construction man in this war. With him were Lieut. Col. Thomas Pennington, old Humble engineer, and Capt. Tibor of the French Army and former Socony-Vac refinery expert who had helped build its Naples plant. Maj. James A. Webb, then a captain at Engineers Hq, Peninsular Base Section, Petroleum Branch, former general superintendent of the Lucey refining and producing interests in Texas and author of the report from which this story is being written, arrived the next day. (*See photo, NPN April* 11, *p.* 22.)

This group had to check every piece of equipment in five refineries and bulk plants that might be of use in storing gasoline, Diesel and black oil. On each piece they decided whether it could be put in shape, what new parts or repairs would do that and how many man-hours the job would take. This was done for every tank, valve, piping, pump, etc. that would make the tankage available for Army use.

The surveyors found 60 tanks in the

five plants that they rated from "fair" to "good" and placed each on a schedule to be ready for use on a certain day. Fifteen tanks they dismissed from all consideration. These estimates were grouped by weekly due dates, that is when the surveyors thought the jobs would be done and how much accumulated storage capacity the Army POL supply sections would have to fill on these certain dates.

For the immediate period from Oct. 20, 1943 to Nov. 18, 1943 the surveyors estimated they could have ready for service 792,700 bbls. of total storage capacity. When Nov. 18th arrived the POL Engineer company had made ready a total of 878,700 bbls. of capacity. For the final storage capacity the surveyors estimated a total of 1,641,700 bbls. would be ready in several months' time. When the storage tank rehabilitation job was finished April 15, 1944 a total of 1,671,700 bbls. of tankage was ready for service.

In addition to the storage tanks, repairs were surveyed in detail and made to loading racks and rail switches at the refineries and to oil docks and dock pipelines.

While the government did not wait on any accounting as to costs but rushed ahead on the reconstruction, nevertheless a careful accounting system was devised whereby the costs could be arrived at and the expense to the U. S. of rehabilitating these plants to be charged to the owning oil companies when final settlement is to be made for the use of the properties. The amount of time, material, trucks, etc. used on the job was figured and resolved into cost per barrel of completed capacity.

An average rate of pay of $80 per month for all personnel used, officers, enlisted men and civilians was assumed. From all this a cost of 28.667c per bbl. was arrived at. As a little more than a million barrels of storage had been rebuilt by March 1, 1944 there was then charged against the owning companies for the work done at each refinery a total of $310,911.96.

Additional work has been done since and will be charged. Against this expense item the companies will have a rental offset which is to be later agreed upon.

The oil companies, against whom these charges are made, are the Socony-Vacuum Oil Co., which had just completed a new and modern refinery near Naples when the war broke, one that had only started on stream; the Standard Oil Co., of New Jersey; "Nafta" which is a contraction of the Italian name by which the Shell Oil Co. is known here, "Benit" the old Socony-Vacuum plant and "AGIP" an Italian government and civilian-owned affair.

All these repair transactions were quickly settled by the Army and representatives of the oil companies signing a contract as the work was starting. The contract was drawn by Maj. Webb and approved by the Army Finance Officer and the oil companies.

POL Engineering companies that did this work were all headed by old oil men, being Capt. James C. Wilkerson, formerly of Stanolind Oil & Gas Co. of Tulsa; Lt. F. W. Fisher; Capt. (then Lieutenant) Charles E. Grant of Emlenton, Pa. from the old oil producing Grant family and Capt. Seldon D. Butcher, formerly a geologist and production engineer from Wichita, Kans.

(And all the time the above work was going on, Naples and these refineries were being bombed regularly but by some bit of good luck the working oil gangs escaped injury. The bombing was directed chiefly at the docks and ships in the harbor.)

Laying Pipe in Record Time But Under War Difficulties

The introduction to Engineer Maj. Webb's report on pipeline construction speaks well of the laboring oil men in Italy in the following words:

"The speed of construction and the efficiency of operation of this pipeline (a 138-mile section running from Naples to the famous fighting point of Cassino) give little hint as to the obstacles encountered or the difficulties in technique that had to be overcome. The personnel involved in the construction and testing of this pipeline were supervised by some of the best oil-field men of Texas, and their accomplishments have been almost miraculous. More so when it is remembered that the major portion of this work was completed during the worst weather months of the Italian winter."

The difficulties were such as—

Crossing the Volturno River on a 400-foot water span during the crest of a flood. An overhead 1 in. cable was strung; 4 in. threaded pipe was used and the lengths screwed and tested with air before pulling across the river. The suspension system was designed to carry a dead load of 160 tons but to take care of the surging factor of the liquid in the line the design was for 300 tons for the span. A tree came down on the flood and broke the first attempt.

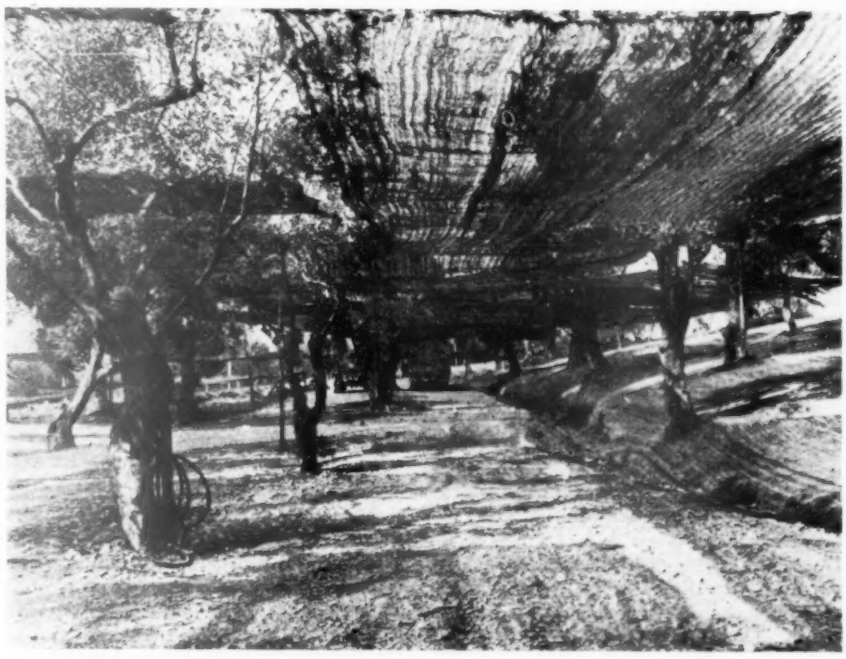
High Waters Delay Work, Flood Data Is Inaccurate

Because of wide flooded fields on each side of the river and many road crossings, sleds had to be used to haul the pipe and often it was carried by hand. Maj. Webb says, "this 15½ mile stretch presented more difficulties than any other section. Yet nearly 80,000 feet of pipe was strung, coupled and stations installed in some 48,000 man-hours, this included 28 road, three railroad, three stream, three canal and one river crossing. This figures out at 210 man-hours for average crews for each operation, allowing 12 coupling men for the extra hazards. General average on the whole operation was 145 man-hours.

Another hard job was done by a green crew. When the line was tested it was found plugged where double road crossings had been installed by a previous crew, and native children had put sticks and stones in the open pipe. This had

(*Continued on p.* 44)

"Filling Station" Near the Front Lines in Italy



Here is how a "filling station" up near the front in Italy looked when the Germans were still expected to be flying over any time. A camouflage net plus the foliage of the trees makes for good protection from spying planes overhead, while the tree trunks serve to hold the hose and filling nozzles off the ground. Wherever possible such filling stations were set up under trees

Washington—By James M. Collins

New "Gas" Pumps Should Be in Quantity Production by Early July

WASHINGTON—Shiny, new gasoline pumps for U.S. service stations probably will be rolling off the production lines of manufacturers by early July and will be welcomed with open arms by petroleum operators whose present equipment in many cases is in sad shape.

Mr. Collins

Initial output will be at a very much higher level than at present, but will not by any means flood the market. Alloy and carbon steel, plus copper and aluminum, will still be under some type of control by WPB—either present controlled materials plan or a simplified priority system—and PAW's pump usage control order—PAO12) will probably have to continue in effect, although somewhat relaxed.

From the standpoint of the pump manufacturer, here is how the situation shapes up at present:

Compared with steel tonnage allotted for manufacture of military and civilian pumps, measuring and dispensing equipment during the first and second quarters of 1945 (about 1100 tons each quarter), PAW has already filed with WPB estimated requirements of approximately 5000 tons of steel for such equipment for the first quarter after V-E Day.

Estimated requirements of copper and aluminum for dispensing equipment manufacture during the first three months after V-E Day for military and civilian needs have also been filed by PAW. The copper figure runs to well over half a million lbs. (compared with ony about 200,000 bs. allocated during the first quarter of 1945), and to about 600,000 lbs. for aluminum (compared with less than 40,000 lbs. authorized for the first quarter).

It should be borne in mind that the above post V-E Day requirements of steel, copper and aluminum filed by PAW with WPB are to meet BOTH military and civilian needs.

Question undoubtedly bothering the 10 or 12 U. S. pump manufacturers, as well as all other industries, is: "Your prognostication sounds fine, but when will V-E Day arrive?" Simplest answer is that an actual "production" V-E Day is already on the way and may arrive before a formal announcement is made by the military that V-E Day has been reached in Europe.

As the tempo of war subsides on the continent and rises in Asia and the Pacific, inevitable production changes will occur in U.S. factories and mills, finally achieving an even keel for an all-out war against the Japs. Our guess is that this production V-E Day will arrive about June 30—at the latest—and that is when pump manufacturers can expect to start the swingover to civilian equipment manufacture.

First step—when WPB notifies PAW and all other government claimant agencies that "Today is V-E Day as far as production is concerned"—will be for PAW immediately to contact pump manufacturers to determine amount of materials each holds, and an estimate from each as to number of pumps for which he needs materials and wants to produce.

Out of the allocations by WPB to PAW of steel, copper and aluminum for such equipment during the ensuing three months (probably approximating the requirements figures already filed by PAW), each of the pump manufacturers will receive a certain percentage. The individual allocation to a manufacturer may be determined by his percentage of total pump manufacture during "normal"—some period prior to the war—after taking into account production cutbacks, amount of materials in inventory, estimated requirements for pumps, etc. This will be done to give all pump manufacturers an even start in the civilian production field.

For service station operators, first indication of a resumption of pump production will come when PAO12 is relaxed to permit installation of additional equipment, or replacement units, which is now generally prohibited. PAW is not expected to go "whole-hog" in dropping the PAO12 bars, but definite easing of the order is anticipated at the proper time.

The official answer to one large-size $64 question—"Why was Petroleum Reserves Corp. established and why does it remain in existence?"—has finally been given by none other than Mr. H. L. Ickes himself. PRC, he said, was never intended to do all of the things its charter would permit; its reason for life was to act as a diplomatic persuader. In blunter language, a club to bring the British into line as regards establishment of an international oil agreement. So much, in effect, Mr. Ickes wrote to Senator Wagner, chairman of Senate Banking and Currency Committee, when asked for his report regarding S.J. Res. 42 by Senator Ed Moore, of Oklahoma, which would put PRC permanently to sleep.

Atlantic Coast—By Frank P. S. Glassey

Deplores PAW Delay in Revealing Plans for Foreign Shipments

NEW YORK—Deputy PAW Davies has inadvertently almost placed himself and his agency in the same predicament OPA has occupied ever since it began issuing confusing statements and attempting to withhold inocuous information. By so doing OPA aroused the possibly erroneous belief that the organization had something to conceal.

Mr. Glassey

Last week Mr. Davies sent two letters to Orville Harden, chairman of PAW Foreign Operations Committee, activating two subcommittees — those dealing with European and North African affairs. The letters were apparently designed to sound out important segments of the industry on methods of handling distribution of petroleum products to liberated areas after the end of the European war.

Both letters, in themselves innocent on the face, were almost identical except as the words "European" and "North African" were interchanged. They referred chiefly to Petroleum Directive 70 for methods of activating the subcommittees, to which Mr. Davies asked that additional members be appointed.

The subcommittee, known as the European Petroleum Supply Committee, was scheduled to meet here on Tuesday of this week, with a meeting of the Foreign Operations Committee slated for Thursday, presumably to ratify any decisions made at the earlier session. The only item on the formal agenda was consideration of the Davies letter.

This is where, in this writer's opinion, official contrariness enters. Efforts were made for a week through the local office of PAW Dist. 1 and through PAW headquarters in Washington to obtain texts of the correspondence. For a week, those efforts were fruitless. The official explanation either was that the matter was "restricted" or that it was "unavailable."

Members of the Foreign Operations Committee in New York, while expressing their private belief that there was no reason whatever why the communications should not be spread on the public record, refused to do so because they considered it a matter within PAW's province.

The catch in the entire proposition was not that the letters, if published textually, could arouse much consternation. It was the hush-hush attitude which prompted some members of the oil industry, including some independent companies, to express fears that there was shady work going on behind the scenes in the allocation of postwar European civilian markets.

Probably that was a bugbear conjured out of thin air. There may be plenty of valid objections to official proposals for

distributing oil products throughout Europe, once the war is over in that theater, but they are not likely to involve a nefarious plot. Yet that is just what this policy of secrecy seemed to be fomenting. What—in the name of PAW Ickes!—is "restricted" about information of this character? Does it hurt the war effort? Is it valuable to the enemy?

So far as the actual plan for sending products to Europe is concerned, that would seem to follow outlines previously revealed here. Distribution will be made through American companies that were established on the Continent before the war and that have facilities there now.

The Davies letter (which has finally been made "available") says that the European Petroleum Supply Committee "shall operate with respect to such European areas, excluding Russia and Turkey, as from time to time are indicated by the Petroleum Administration for War. The Committee shall deal with crude petroleum and petroleum products of all kinds, except as may be otherwise provided by the director of the Foreign Supply and Distribution Division of the Petroleum Administration for War.

"From time to time, the director will transmit to the Committee the petroleum supply program approved by the United States for each country or area. The director will inform the Committee as regards the areas of supply from which petroleum will be available to meet the aforementioned supply programs.

"In carrying out its operations, the committee shall co-ordinate its activities and co-operate as provided in paragraph (h) of Petroleum Directive 70. Pursuant to paragraph (c) of Petroleum Directive 70, the committee shall arrange for the compilation and transmission to it of all necessary statistics and other information by the appropriate committees and government agencies . . ."

What should be "restricted" about such verbiage—which means little or nothing? It has been released, finally, more than a week after written. Some members of the industry, however, are wondering whether the initial secrecy may be a veil for a more detailed program, up till now shrouded in complete obscurity.

Those who favor the "status quo" idea of distributing oil products to civilians in Europe, after the end of the war there, argue that this merely means preserving a set-up which has proved workable during hostilities. They say that independents and others who were not in the European market before the war will have an opportunity to engage in unrestricted competition once the period of rehabilitation is ended. They assert, furthermore, that a company with one bulk terminal in Europe which was destroyed in the course of the war will receive as equitable pro-rata treatment as a company which had six, of which only two were destroyed.

The opponents haven't been too vocal as yet. They are likely to become more so when the Foreign Operations Committee meets here this week. Their argument is for a pool formed in the U. S., from which products could be shipped to Europe, rather than for the formation of a pool of products in Europe, which might be distributed through the auspices of a relatively few companies.

They further mutter the ominous word "cartel" and declare that though the Justice Department is avowedly on the warpath against cartels, it is allowing a big one to gather strength through this so-called temporary arrangement.

PIPELINES NPN Writers at Three Vital Points Discuss the Industry's problems

Midwest—By Earl Lamm

Claims of Unfair Distribution of Ethyl Supplies Aired Again

CHICAGO—Stories are again being heard about unfair uses to which the limited quantity of Ethyl gasoline is being put. Different jobbers and refiners say their competitors are taking advantage of them because of the way the limitation order on manufacture of premium is written. (PAO 21 and amendments).

Mr. Lamm

They point out that it is based upon a percentage of percentage of Ethyl made during the base period and where refinery capacities have been increased to make military gasoline, PAO 21 gives them extra privileges in making civilian premium. However, it seems that comparatively few understand how the order works.

To cite an example, if a refinery had a gasoline making capacity of 30,000 b/d in the base period of 1941 and was actually producing 6000 b/d of premium, this was equal to 20% of total make. PAO 21 as it stands now, limits the make to 37½% of the percentage manufactured in the base period, and 37½% of 20% is 7½% and 7½% of 30,000 b/d is 2250 b/d of Ethyl, according to PAW.

But if since the base period of 1941, the total gasoline manufacture, through increased refinery capacity, has been stepped up to 50,000 b/d, 7½% of that amount would be 3750 b/d of Ethyl, or an increase of 1500 b/d, which amount the refiner possibly could use to swing new customers his way if he disregarded PDO 20 intended to equalize distribution.

A retailer with a string of stations recently ran newspaper advertisements in Southern Illinois saying "all the premium gasoline you want," which amazed a number of people, who wondered how he got that much. We do not pretend to know the answer in that case; however, it can be pointed out that PAO 21 limits the manufacture only of premium and does not regulate the sale.

Thus, a jobber may obtain supplies from one or more refiners with increases like the one mentioned or from anyone else he can persuade to sell it to him. Another version, probably untrue, is that certain suppliers are boosting the octane of regular and selling it as premium by throwing in a little surplus aviation grade.

Peculiar thing about these rumors is that no one has yet come up with specific charges to bear them out and PAW says nothing can be done about enforcement until definite information is had.

• • •

Independent jobbers, dealers and others in oil marketing are certain to welcome a simplified procedure for restoring dealer inventories to efficient working levels in lieu of the long proposed bonus bail-out, which is being dropped by OPA; that is, provided the new procedure OPA plans to draw up is really simple.

Midwest oil men, we believe, will appreciate the nice choice of language by OPA officials when they say the bail-out is an almost complete failure due to dealers' disinterest in complicated standards, forms and regulations.

But the real story has been lack of general confidence in OPA itself, and this lack of confidence is rapidly becoming complete disinterest as the existence of OPA becomes less and less necessary. In some districts we could name, where local OPA officials have taken the bull by the horns in co-operating with industry, the present bail-out is an almost complete success and not a failure. The reason is that a simple procedure is already working in those spots without any harm to the rationing program. In other places, where local OPA officials lose sight of the over-all purpose of wartime regulation and can not see beyond the tightest interpretation of Washington's hide-bound rules, few dealers however honest will ever stick their necks out by admitting shortages to OPA.

• • •

Some rumblings on asphalt and road oil are being heard as we go to press. Refiners say they don't like PAO 80, which, effective May 1, limits the number of grades of asphalt and thus eliminates competition on a quality basis for it does away with specialty products. It puts business on merely a few government specifications.

Cause for issuing the order is sup-

(*Continued on p.* 48)

OPA Scans Group 3 Prices, But Doubts Formula Imperilled by Adverse Basing Point Decision

NPN News Bureau

WASHINGTON — The legality of Group 3 and other delivered price formulas used by oil companies is now receiving thorough study by government officials following two Supreme Court decisions handed down this week.

OPA, meantime, plans to make whatever changes "may be necessary" in its price regulations in order to conform with the high Court's decisions which disposed of the Corn Products and Staley Cases (Corn Products Refining Co. v. F.T.C.; F.T.C. v. A. E. Staley Mfg. Co.) which had been before the Federal Trade Commission and the courts since 1939.

The court ruled that basing point prices used by the two concerns resulted in price discrimination injurious to competition and in violation of the Robinson-Patman Act. (*Text of Act below.*)

FTC had charged that the basing point system of pricing sales resulted in discrimination in price between different purchasers since the system did not give effect to the freight rate advantage which one purchaser might have over another.

The price to any customer, it was found, was the price at the basing point plus freight from there to the point of delivery, even when shipment was made from a point either nearer to or farther from the customer than the basing point.

The court considered at length the contention that the legislative history of the Act made it clear that Congress did not intend to disturb the long-practiced system of basing points when it passed the Robinson-Patman Act, but concluded that such history was not conclusive either way; that the inclusion in the price of an amount for freight not actually incurred was a prohibited discrimination under the Act.

Careful Study Promised

Following the decisions by the court, OPA stated that a study would be made of OPA price regulations to determine whether any changes will be required, adding that "the decisions have no direct connection with price control."

"Whether, and to what extent, if any, it may be necessary for maximum price regulations to be amended in view of the Corn Products and Staley cases can be determined only after careful study of the two Supreme Court opinions," OPA said.

"While this study is being completed, compliance with the regulations will not compel any seller to violate the Robinson-Patman Act. The price discrimination that might under some circumstances flow from charging the full maximum price permitted by a regulation can always be avoided by charging a lower price that will not cause discrimination in favor of the seller's other customers.

"A seller who has been found by the Trade Commission or a court to be in violation of the Robinson-Patman Act and who would sustain substantial hardship if he eliminated price discrimination by lowering his higher prices to conform to the Act may apply under Supplementary Order No. 41, issued by OPA two years ago, for permission to increase his lower maximum prices to those purchasers in whose favor he has been found to have discriminated."

Lower Court Reversed

In the Staley case, the Supreme Court reversed the lower court which had held that Staley had justified its similar discriminations by showing that it adopted the system in "good faith" to meet the equally low price of a competitor. That defense, provided by the Robinson-Patman Act, was intended to apply to individual transactions, according to the court, and "good faith" could not be pleaded to justify a discriminatory system.

Final effect of the court's decision was not immediately ascertainable as regards OPA oil price rules embodying formulas for computing delivered-at-destination ceilings in the Midwest on gasolines and fuel oils, which provide for the addition of Oct. 1, 1941, rail rate from Tulsa to certain specific prices.

Doubt Oil Prices Affected

OPA oil price officials, however, firmly state that the formulas which have been developed under MPR 88 for purpose of computing delivered-at-destination ceiling prices in the Midwest on gasolines and fuel oils are not comparable to a basing point price system. As far as they can determine, they add, the court's decisions in the two sugar cases will have no effect on these oil price formulas.

In explanation of their view, these officials point out that OPA formulas for computing delivered prices employ certain specific base figures, to which is added one other factor (Oct. 1, 1941 rail rate from Tulsa) in arriving at a cents-per-gal. ceiling price at the destination. Both of these factors are not comparable to those used in setting prices on a Group 3 basis, they add.

Further, it is explained that OPA, in lieu of setting forth a formula for computing delivered prices, could have spelled out specific dollars-and-cents ceiling prices on delivered sales at every town and city in the area affected, but this is patently impractical. If that had been done, the prices established would have been no different than those which sellers now arrive at in using MPR 88 delivered-at-destination formulas, they said.

WAR OIL NEWS from WASHINGTON

HERBERT YOCOM *Bureau Chief*

NATIONAL PRESS BLDG.

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Text of Robinson-Patman Act

Following is the full text of the Robinson-Patman act:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that Sect. 2 of the act entitled "an act to supplement existing laws against unlawful restraints and monopolies, and for other purposes," approved October 15, 1914, as amended (U. S. C., title 15, sec. 13), is amended to read as follows:

"Sec. 2 (A) that it shall be unlawful for any person engaged in commerce, in the course of such commerce, either directly of indirectly, to discriminate in price between different purchasers of commodities of like grade and quality, where either or any of the purchases involved in such discrimination are in commerce, where such commodities are sold for use, consumption, or resale within the United States or any territory thereof or the District of Columbia or any insular possession or other place under the jurisdiction of the United States, and where the effect of such discrimination may be substantially to lessen competition or tend to create a monopoly in any line of commerce, or to injure, destroy, or prevent competition with any person who either grants or knowingly receives the benefit of such discrimination, or with customers of either of them:

Provided, that nothing herein contained shall prevent differentials which make only due allowance for differences in the cost of manufacture, sale, or delivery resulting from the differing methods or quantities in which such commodities are to such purchasers sold or delivered: Provided, however, that the Federal Trade Commission may, after due investigation and hearing to all interested parties, fix and establish quantity limits, and revise the same as it finds necessary, as to particular commodities or classes of commodities, where it finds that available purchasers in greater quantities are so few as to render differentials on account thereof unjustly discriminatory or promotive of monopoly in any line of commerce; and the foregoing shall then not be construed to permit differentials based on differences in quantities greater than those so fixed and established; and provided further, that nothing herein contained shall prevent persons engaged in selling goods, wares, or merchandise in commerce from selecting their own customers in bona fide transactions and not in restraint of trade; and provided further, that nothing herein contained shall prevent price changes from time to time where in response to changing conditions affecting the market for or the marketability of the goods concerned, such as but not limited to actual or imminent deterioration of perishable goods, obsolescence of seasonal

goods, distress sales under court process, or sales in good faith in discontinuance of business in the goods concerned.

"(B) upon proof being made, at any hearing on a complaint under this section, that there has been discrimination in price or services or facilities furnished, the burden of rebutting the prima-facie case thus made by showing justification shall be upon the person charged with a violation of this section, and unless justification shall be affirmatively shown, the commission is authorized to issue an order terminating the discrimination; provided, however, that nothing herein contained shall prevent a seller rebutting the prima-facie case thus made by showing that his lower price or the furnishing of services or facilities to any purchaser or purchasers was made in good faith to meet an equally low price of a competitor, or the service or facilities furnished by a competitor.

"(C) That it shall be unlawful for any person engaged in commerce, in the course of such commerce, to pay or grant, or to receive or accept, anything of value as a commission, brokerage, or other compensation, or any allowance or discount in lieu thereof, except for services rendered in connection with the sale or purchase of goods, wares, or merchandise, either to the other party to such transaction or to an agent, representative, or other intermediary therein where such intermediary is acting in fact for or in behalf, or in subject to the direct or indirect control, of any party to such transaction other than the person by whom such compensation is so granted or paid.

"(D) That it shall be unlawful for any person engaged in commerce to pay or contract for the payment of anything of value to or for the benefit of a customer of such person in the course of such commerce as compensation or in consideration for any services or facilities furnished by or through such customer in connection with the processing, handling, sale, or offering for sale of any products or commodities manufactured, sold, or offered for sale by such person, unless such payment or consideration is available on proportionally equal terms to all other customers competing in the distribution of such products or commodities.

"(E) That it shall be unlawful for any person to discriminate in favor of one purchaser against another purchaser or purchasers of a commodity bought for resale, with or without processing, by contracting to furnish or furnishing, or by contributing to the furnishing of, any services or facilities connected with the processing, handling, sale, or offering for sale of such commodity so purchased upon terms not accorded to all purchasers on proportionally equal terms.

"(F) That it shall be unlawful for any person engaged in commerce, in the course of such commerce, knowingly to induce or receive a discrimination in price which is prohibited by this section."

Sec. 2. That nothing herein contained shall affect rights of action arising, or litigation pending, or orders of the Federal Trade Commission issued and in effect or pending on review, based on Section 2 of said act of Oct. 15, 1914, prior to the effective date of this amendatory act; Provided, that where, prior to the effective date of this amendatory act, the Federal Trade Commission has issued an order requiring any person to cease and desist from a violation of Section 2 of said act of Oct. 15, 1914, and such order is pending on review or is in effect, either as issued or as affirmed or modified by a court of competent jurisdiction, and the commission shall have reason to believe that such person has committed, used or carried on, since the effective date of this amendatory act, or is committing, using or carrying on, any act, practice or method in violation of any of the provisions of said Sect. 2 as amended by this act, it may reopen such original proceeding and may issue and serve upon such person its complaint, supplementary to the original complaint, stating its charges in that respect.

Thereupon the same proceedings shall be had upon such supplementary complaint as provided in Sect. 11 of said act of Oct. 15, 1914. If upon such hearing the commission shall be of the opinion that any act, practice, or method charged in said supplementary complaint has been committed, used, or carried on since the effective date of this amendatory act, or is being committed, used or carried on, in violation of said Sect. 2 as amended by this act, it shall make a report in writing in which it shall state its findings as to the facts and shall issue and serve upon such person its order modifying or amending its original order to include any additional violations of law so found.

Thereafter the provisions of Sect. 11 of said act of Oct. 15, 1914, as to review and enforcement of orders of the commission shall in all things apply to such modified or amended order. If upon review as provided in said Sect. 11 the court shall set aside such modified or amended order, the original order shall not be affected thereby, but it shall be and remain in force and effect as fully and to the same extent as if such supplementary proceedings had not been taken.

Sec. 3. It shall be unlawful for any person engaged in commerce, in the course of such commerce, to be a party to, or assist in, any transaction of sale, or contract to sell, which discriminates to his knowledge against competitors of the purchaser, in that, any discount, rebate, allowance, or advertising service charge is granted to the purchaser over and above any discount, rebate, allowance, or advertising service charge available at the time of such transaction to said competitors in respect of a sale of goods of like grade, quality, and quantity, to sell, or contract to sell, goods in any part of the United States at prices lower than those exacted by said person elsewhere in the United States for the purpose of destroying competition, or eliminating a competitor in such part of the United States; or, to sell, or contract to sell, goods at unreasonably low prices for the purpose of destroying competition or eliminating a competitor.

Any person violating any of the provisions of this section shall, upon conviction thereof, be fined not more than $5000 or imprisoned not more than one year, or both.

Sec. 4. Nothing in this act shall prevent a cooperative association from returning to its members, producers, or consumers the whole, or any part of the net earnings or surplus resulting from its trading operations, in proportion to their purchases or sales from, to, or through the association.

Approved, June 19, 1936.

Washington News

PRC's Purpose Not Yet Fulfilled, Says Ickes; Hints Use as Diplomatic 'Club' Over British

NPN News Bureau

WASHINGTON—Petroleum Reserves Corp. "has not yet fulfilled its purpose" and this is not the "proper time" to dissolve it, PRC President Ickes has written Senator Wagner, of New York, chairman of the Senate Banking and Currency Committee.

Mr. Ickes' letter was in response to an invitation from Senator Wagner that he express his opinion regarding a resolution by Senator Ed Moore, of Oklahoma, (S. J. Res. 42) calling for dissolution of PRC, which was referred to the Senate Banking Committee for its consideration.

PRC was established, Mr. Ickes wrote, when there was "very great concern" for the future of foreign oil concessions held by U. S. companies. He added that he did NOT believe it was "mere coincidence" that shortly after PRC announced it would construct an Arabian pipeline British officials were on their way "over here to talk about an Anglo-American petroleum agreement."

Text of Ickes' Letter

Partial text of Mr. Ickes' letter to Senator Wagner, follows:

"Thank you for your letter of March 9, inviting an expression from me concerning S. J. Res. 42, the purpose of which is to liquidate the Petroleum Reserves Corp.

"I can readily see why a reading of the charter of the corporation, which appears to have been the extent of the research in connection with the proposed bill, might lead one to believe that it was set up to do some or all of the things charged in this resolution. However, a better knowledge of the activities of the corporation and of the part that its creation has played in strengthening the future petroleum position of the United States would, I am sure, effectively dispose of these allegations.

"The Petroleum Reserves Corp. was set up at a time when there was very great concern, both in the government and in the oil industry, for the future of foreign oil concessions held by United States companies. The history of the struggle for oil following the First World War more than justified that concern.

"I felt, and I am sure that I was not alone in this belief, that the United States Government should not sit back and indulge in wishful thinking about its future oil supplies. For one thing, I felt that it was high time that some specific steps were taken to bring about the establishment of a program for the orderly conduct of the international oil trade, before chaos once more broke loose. I felt, and I believe the facts have borne me out, that if anything was to be done in this direction, the United States government would have to take the lead.

"It may or may not be mere coincidence that not long after the Petroleum Reserves Corp. announced that it would construct a crude oil pipeline from the Persian Gulf to the Mediterranean, representatives of the British government were on their way over here to talk about an Anglo-American petroleum agreement. Personally, I do not believe it was coincidence, but I am content to let the historians decide that.

Cites British Visits

"At any rate, the British have been over here, twice in fact, and we are in the process of working out a petroleum agreement with the British government, an agreement which we hope will be broadened in due course to include other countries. However, the agreement with the British has not yet been consummated.

"The Petroleum Reserves Corp., in my opinion, has not yet fulfilled its purpose. In time it perhaps ought to be dissolved, but I should not think this the proper moment to do so . . ."

Congressmen Skeptical as Gordon Duke Renews Fight for Oil Transport Subsidy 'for All'

NPN News Bureau

WASHINGTON—Gordon Duke, president of Southeastern Oil, carried his fight against PAW Directive 59 and PAO 5 to the House Banking and Currency Committee as it concluded hearings this week on the subsidy bill, S. 502.

(The measure authorizes expenditure of $1,388,000,000 for subsidy programs, including $290,000,000 for petroleum subsidies. Breakdown of the latter figure shows that $150,000,000 is to be spent for East Coast oil transportation subsidy; $20,000,000 for Midwest oil transportation subsidy; $75,000,000 for the stripper-well subsidy program, and $45,000,000 to subsidize oil transportation to the West Coast.)

In a brief but hard-hitting statement, Mr. Duke asked the committee to adopt an amendment which would permit all shippers and receivers to share in oil transportation subsidies regardless of whether they complied with such "voluntary" regulations as Directive 59. His proposed amendment provides that subsidy payments to cover war added costs of transporting petroleum and products from PAW Districts 2 and 3 to PAW District 1 "... shall be made to all shippers and/or receivers, so long as such shippers and/or receivers utilize methods of transporting petroleum similar to those used by the majority of all shippers and receivers."

Speaks for Two Other Firms

Mr. Duke, who said he spoke not only for Southeastern but also for two other oil firms—Power Oil Co., Orangeburg, S. C., and Hygrade Oil Co., Hartford, Conn.—emphasized that he and other small operators "don't expect a subsidy when we use a different form of transportation from that of other companies, but we *do* ask such treatment when we use the same form of transportation."

His proposed amendment immediately received a cool reception from Committee Chairman Spence (D. Ky.) who told NPN he belived it was "unnecessary," because it dealt with an "administrative question which could best be handled by PAW." Rep. Spence made it clear that, as far as he was concerned, the amendment was not a proper part of the subsidy bill.

Final committee action on the measure and on Mr. Duke's proposed amendment is expected soon, but an executive session for that purpose has been delayed because of hearings on Bretton Woods proposals now going on.

In the course of the hearings, Mr. Duke was asked by Rep. Monroney (D. Okla.) why he did not participate in the "pooling plan" set up under PAW Directive 59. Without hesitation, the Southeastern chief replied that he and other East Coast independent oil men found that joining the "pool" meant restricting their business to 70% of normal. No such restriction applied to major oil companies operating in the same district, he added, because they also operated in other sections of the country and did as much as 150% of normal business.

By staying outside the "pool," Mr. Duke continued, independents hoped to salvage as much of their business as possible for the postwar era. PAW had seemed satisfied to make its pooling plan "purely voluntary," he said. He concluded: "Now we are told that if we don't join in the 'voluntary program,' we can't get a subsidy . . .This makes it economically impossible to operate."

Conceding that PAW Directive 59 was needed at one time, "due to a shortage of transportation" facilities, Mr. Duke said: "We frankly and sincerely believe that PAW 59 is no longer necessary." It has been allowed to remain effective, he maintained, because "it turned out to be a handy device to line the pockets of major oil firms with gold even after the need (for the directive) no longer existed."

The Southeastern executive also told the committee that, while he was not one to criticize PAW unduly, "because they have done a very fine job," nevertheless he felt that that agency was staffed with "people from the bigger firms in their industry . . . who are prone to look at problems in the light of their own experience. It also happens that almost no one in PAW is from the smaller oil firms."

Because his own firm found it virtually "impossible to operate" under PAW's program, Mr. Duke added, it brought into this country about 1,000,000 bbls. of oil from Mexico before April, 1944. He also said that he believed greater quantities of oil would reach our shores were it not for restrictive measures worked up by industry committees and "rubber-stamped" by PAW.

Pauley Named U. S. Spokesman on Reparations

NPN News Bureau

WASHINTON — With final victory over Nazi Germany drawing close, President Truman turned his attention this week to the question of making the enemy pay for the havoc it created in the Allied Nations and appoined Edwin A. Pauley, California oil man, as American member of the Allied Reparations Commission.

Mr. Pauley, who will attend the commission's meeting in Moscow in May and have the rank of ambassador during settlement of reparations on Germany and Japan, has resigned as treasurer of the Democratic National Committee to accept the post.

Edwin A. Pauley . . . he has a mission in Moscow

Mr. Pauley is president of three oil companies, Petrol Corp. of Los Angeles and the Fortuna Petroleum and Golconda Petroleum corporations. He says he is not a "soft peace" man.

"Whether we have a 'hard peace' or a 'soft peace,'" he added, "is a question for all the United Nations and their governments to decide.

"What I can promise in my new position is that, once the peace is made, I shall do everything in my power to prevent it from being a 'brittle' peace—that is, one that may be hard in the making but will not hold together, under the strain of postwar economics.

"That is the mistake that was made at the end of the first World War. Subsequently, and partly because of that 'brittle' quality of the peace, Germany was able to rearm.

"I make my pledge that it will not happen again."

Appointed to accompany Mr. Pauley to the Moscow conference was Dr. Isador Lubin, commissioner of labor statistics, who was named American member of the commission by State Secretary Stettinius on March 12, with approval of President Roosevelt.

Long active in government petroleum affairs as well as in the industry, Mr. Pauley was special representative of California's governor on the National Resources Commission in 1939 and on the Interstate Oil Compact Commission in 1940. The following year he was named special United States representative to act as liaison advisor with Great Britain on use of tankers; special U. S. representative in forming plans to establish PAW's predecessor, the Office of the Coordinator of the Petroleum Industry in 1941; special U. S. representative on petroleum supplies for Britain and Russia, and for a joint report with Britain on enemy petroleum supplies.

Claude Parsons to Leave PAW

NPN News Bureau

WASHINGTON—C. L. Parsons, PAW director of materials, Washington, told members of the industry attending a meeting in Tulsa April 2, to discuss the materials situation that he is planning to leave PAW June 5.

Senate Oil Committee To Start Hearings on May 17; Committees Appointed to Align Testimony

NPN News Bureau

WASHINGTON — Seven oil industry committees have been appointed to present testimony before hearings of the special Senate Committee Investigating Petroleum Resources, it was announced this week by William R. Boyd, Jr., chairman of the five-man steering committee set up recently to handle oil industry representation.

Meantime, Senator O'Mahoney, of Wyoming, chairman of the Senate committee, announced that hearings will get under way on May 17, in conjunction with a Senate judiciary subcommittee which is considering a bill (S. 11) by Sen. O'Mahoney, providing for registration of cartels.

The committee of five named by an informal conference of some 50 oil and gas representatives on April 19 to develop plans and procedure for industry appearances and presentation of testimony before the Senate committee has approved the designation of the committees listed below, Mr. Boyd, chairman, of the committee said.

Senate Oil Inquiry

"It is agreeable to Sen. O'Mahoney" Mr. Boyd said, "for the oil and gas industries to plan for presentation of testimony by representative industry witnesses, and the 'Committee of Five' is assigning to each committee indicated the responsibility for the selection of industry witnesses and the preparation of the material to be submitted for the section of the hearing covered under the heads outlined in the Senate Committee's Tentative Outline of Hearings (*See NPN April 11 p. 8*). Of course, the respective committees should feel at perfect liberty to call upon any oil man not a member of the committee for assistance."

Suggests Call by Mid-May

Mr. Boyd suggested that each committee chairman call his group together in Washington on May 14 "or sooner" to plan procedure, etc., since this date closely precedes the next regular meeting of P.I.W.C.

At the same time, Sen. O'Mahoney disclosed that Attorney General Biddle and Assistant Attorney General Wendell Berge will be among the first witnesses. Other government agencies, including PAW, the State Department, and the Federal Trade Commission have been invited to testify, but no dates for their appearances were given.

"The problems of world trade in the postwar world," the Wyoming senator commented, "are as important and far reaching as the problems of organization for peace, because without a stable world economy it will be difficult to maintain peace organization. The world will have difficulty recovering from the disastrous destruction wrought in the war unless we find a way to stimulate production everywhere. The nature and the responsibilities of the organizations which carry on world trade constitute, therefore, a problem of the most serious importance."

The seven industry committees and type of testimony each will plan, follow:

Cartels in Relation to Petroleum in World Trade—Orville Harden, chairman, Standard Oil Co. (N. J.); L. B. Levi, Socony-Vacuum Oil Co., Inc.; W. S. S. Rodgers, The Texas Co.; P. O. Settle, Gulf Oil Corp.; Russell B. Brown, Independent Petroleum Association of America; Harry D. Collier, Standard Oil Co. of California; W. Alton Jones, Cities Service Co.

Petroleum Requirements—Robert E. Wilson, chairman, Standard Oil Co. (Indiana); Stewart P. Coleman, Standard Oil Co. (N. J.); Joseph E. Fogue, Chase National Bank; J. French Robinson, American Gas Assn.; H. J. Struth, Texas Mid-Continent Oil & Gas Assn.; James V. Brown, Independent Petroleum Association of America; E. Buddrus, Independent Natural Gas Association; Earl W. Wagy, Standard Oil Co. of California; Fred Van Covern, American Petroleum Institute.

Sources of Petroleum Supply (Domestic and Foreign)—John M. Lovejoy, chairman, Seaboard Oil Co. of Delaware, Inc.; E. Buddrus, Independent Natural Gas Assn.; Ralph T. Zook, Independent Petroleum Association of America; A. C. Mattei, Honolulu Oil Corp.; W. H. Ferguson, Continental Oil Co.; E. DeGolyer, Dallas, Tex.; J. Edgar Pew, Sun Oil Co.; A. I. Levorsen, Tulsa, Okla.; Ralph B. Lloyd, Western Oil & Gas Assn.; Henry Phillips, Sinclair Oil Corp.; J. C. Hunter, Mid-Continent Oil and Gas Assn.; R. S. Shannon, Pioneer Oil Corp.; Harry C. Wiess, Humble Oil & Refining Co.; Charles F. Roeser, Roeser & Pendleton, Inc.; Walter S. Hallanan, Plymouth Oil Co.; J. French Robinson, American Gas Assn.; James Terry Duce, Arabian-American Oil Co.; George S. Walden, Standard-Vacuum Co., Inc.; George A. Hill, Jr., Houston Oil Co. of Texas.

American Petroleum Interests in Foreign Countries—Harold F. Sheets, chairman, Socony-Vacuum Oil Co., Inc.; Eugene Holman, Standard Oil Co., (New Jersey); J. Frank Drake, Gulf Oil Corp.; A. E. Watts, Sinclair Oil Corp.; Don R. Knowlton, Phillips Petroleum Co.; H. D. Collier, Standard Oil Co. of California; George A. Hill, Jr., Houston Oil Co. of Tex.; W. Alton Jones, Cities Service Co.; W. S. S. Rodgers, The Texas Co.; R. H. Colley, Atlantic Refining Co.; Reese H. Taylor, Union Oil Co. of California.

The Independent Company—Ralph T. Zook, *Chairman*, Independent Petroleum Ass'n of America; Maj. B. A. Hardey, Commerce National Bank Building, Shreveport, La.; Charles F. Roeser, Roeser & Pendleton, Inc.; C. L. Henderson, Western Petroleum Refiners Assn.; Harry A. Logan, National Petroleum Assn.; B. L. Majewski, Deep Rock Oil Corp.; Lee S. Wescoat, Pure Oil Co.; M. H. Robineau, Frontier Refining Co.; C. P. Watson, Oil Producers' Agency of California; L. L. Aubert, Bankline Oil Co.; Maston Nixon, Texas Mid-Continent Oil & Gas Assn.; O. D. Donnell, Ohio Oil Co.; C. C. Herndon, Skelly Oil Co.; E. Buddrus, Independent Natural Gas Assn.; T. H. Barton, Lion Oil Refining Co.; Frank M. Porter, Kansas-Oklahoma Mid-Continent Oil & Gas Assn.; A. S. Ritchie, D. R. M. Co.; Dana Hogan, San Joaquin Valley Oil Producers Assn.; Van S. Welch, Flynn, Welch & Yates; N. W. Shiarella, Kentucky Oil and Gas Assn.; A. W. Peake, Standard Oil Co. (Indiana); K. S. Adams, Phillips Petroleum Co.; John R. Suman, Standard Oil Co. (New Jersey); B. Brewster Jennings, Socony-Vacuum Oil Co., Inc.; Merle H. Becker, W. C. McBride & Co.

Postwar Disposal of Pipe Lines, Refineries and Tankers—W. Alton Jones, chairman, Cities Service Company; W. S. S. Rodgers, The Texas Co.; Sidney A Swensrud, Standard Oil Co. (Ohio); J. R. Parten, Premier Refining Co.; J. Howard Pew, Sun Oil Co.; Orville Harden, Standard Oil Co. (New Jersey); Hines Baker, Humble Oil & Refining Co.; John Newton, Magnolia Petroleum Co.; B. I. Graves, Tide Water Associated Oil Co.; Robert H. Colley, Atlantic Refining Co.; C. S. Jones, Richfield Oil Corp.; Fayette B. Dow, Washington, D. C.; Clark H. Kountz, Sinclair Oil Corp.; T. E. Swigart, Shell Pipe Line Corp.; C. H. Kunze, Socony-Vacuum Oil Co.; G. L. Rowsey, Taylor Refining Co.; E. Buddrus, Independent Natural Gas Assn.; J. French Robinson, American Gas Assn.; Jake L. Hamon, Cox & Hamon; W. L. Stewart, Jr., Union Oil Co. of California.

An industry committee to co-ordinate the work of the six committees above was named, with A. Jacobsen, Amerada Petroleum Corp., as chairman. Chairmen of the six committees already listed will serve with him.

Named to PAW Foreign Post

Appointment of Erwin C. Hannum, formerly of the Budget Bureau, as executive assistant to the chairman of the Foreign Operating Committee of PAW was announced this week by Deputy PAW Davies. In his newly created office Mr. Hannum will work on problems that affect the three PAW foreign divisions and will assist in co-ordinating the activities of the divisions with other PAW operations and with the work of other government agencies interested in foreign petroleum matters. Mr. Hannum will be executive secretary of the committee succeeding Howard L. Freeman who resigned to join the Oil Well Supply Co. of New York

Right to Certify 5000 More For Deferment Granted PAW

NPN News Bureau

WASHINGTON — PAW's plea to the Manpower Inter-Agency Committee for several thousand additional draft certifications to prevent loss of vital oil workers under 30 years of age to armed forces has been granted.

PAW will now be permitted to certify deferments for 30% of number of men listed with it by oil companies (those under 30 who were deferred in class 2-A and 2-B on Jan. 1, 1945) plus an additional 5000. Besides that figure combination, an undetermined number of additional certifications have been transferred to PAW from other Government agencies.

Tariff Commission Forecasts 10-20% Increase In Petroleum Demand 3 Years After the War

NPN News Bureau

WASHINGTON—U. S. consumption of petroleum products probably will rise 10 to 20% above 1939 levels within three years after total victory, despite a temporary shortage of oil consuming equipment, the U. S. Tariff Commission predicted this week in a report to the Senate.

An even brighter oil-consumption picture was drawn for 1951-'56, when more automobiles, household oil burners and other equipment are expected to be available to meet growing demands. By that time, pre-supposing per capita income remaining at the 1939 level, the report states consumption may be 20 to 35% greater than in '39 and may run somewhere between 1450 and 1630 million bbls. annually. Value of this estimated overall petroleum-products consumption would be about 1850 to 2075 million dollars, "as the prices of crude petroleum are likely to be higher than before the war."

Turning to the question of what a 75% rise in per capita income would do to the long-run petroleum consumption picture, the Commission made the following comments:

"Consumption of petroleum products might become 30-45% greater than in 1939, representing from 1575 to 1750 million bbls. of crude and natural gasoline. (Various officials of large oil companies have estimated demand in the postwar period at figures considerably higher than these.) Prices would probably be even somewhat higher than with national income at 1939 levels, so that the value of this quantity might be in the range of 2250 to 2500 million dollars."

Predictions on postwar consumption of gasoline, fuel oil and asphalt, both short term (within two or three years after total victory) and long term (sometime between 1951 and 1956) as set forth in the Commission's report, are summarized in the table below:

Copies of the Commission's report, entitled "Post-War Import Trade of the United States and Production of Related Items (Vol. 2, Sec. 1, Schedule 1—Chemicals, Oils and Paints)"—may be obtained by writing to the U. S. Tariff Commission, Docket Section, rm. 249, F St., between 7th and 8th Sts., NW, Washington D. C.

The report, which covers many items ranging from silk to wine in addition to crude and petroleum products, was prepared in response to Senate Resolution 341, passed in the 78th Congress. It directs the Commission to examine and report on all articles which were imported in 1939 to a value exceeding $100,000 or which the Commission believes are likely to be imported in excess of that value after the war.

Asks Congress Approval Of IRB Drilling Option

NPN News Bureau

WASHINGTON — Rep. Doughton, (D., N. C.), chairman of the powerful House Ways and Means Committee, has called for formal congressional endorsement of intangible drilling costs option in IRB's tax regulations.

Mr. Doughton's action was taken in House Concurrent Resolution 50. It would put Congress on record as recognizing and approving IRB tax regulations which grant taxpayers the option to deduct intangible drilling and development costs as expenses. Congress should do this, his measure points out, because it has enacted time and again revenue acts containing sections relating to deduction for intangible drilling and development costs in the case of oil and gas wells.

Introduction of such a measure by the House Ways and Means Committee chairman points, almost certainly, to its approval by Congress as a whole. However, it appears that some little time will elapse before it is considered by the committee since that group is now engaged in lengthy hearings on extension of the Reciprocal Trade Agreements Act, and these are expected to last until mid-June.

Meantime, Russell B. Brown, general counsel of I.P.A.A., said that he and Judge J. C. Hunter, president of the Mid-continent Oil & Gas Assn.,—who are co-chairmen of the industry's general depletion committee—have given Rep. Doughton's measure very careful study. He added:

"We believe that Mr. Doughton's bill will effectuate the purposes of correcting the problem created by the court's opinion in the F. H. E. Oil Co. case. The character and type of the bill, and its introduction by Mr. Doughton, indicate that it should have the early approval of Congress."

Text of Resolution

Full text of H. Con. Res. 50 follows:

"Resolved by the House of Representatives (the Senate concurring), that in the public interest the Congress hereby declares that by the re-enactment, in the various revenue acts beginning with the revenue act of 1918, of the provisions of Sect. 23 of the Internal Revenue Code and of the corresponding sections of prior revenue acts allowing a deduction for ordinary and necessary business expenses, and by the enactment of the provisions of Sect. 711 (B) (1) of the Internal Revenue Code relating to the deduction for intangible drilling and development costs in the case of oil and gas wells, the Congress has recognized and approved the provisions of Section 29.23 (M)—16 of Treasury Regulations 111 and the corresponding provisions of prior Treasury regulations granting the option to deduct as expenses such intangible drilling and development costs."

OPA To Permit Filing 'Gas' Coupons in Central Office

NPN News Bureau

WASHINGTON—Starting May 3, a gasoline dealer operating more than one station may send his ration coupons and checks to a central office if he gets approval of his OPA District Director.

The director will grant approval, OPA said, "if he finds that the coupons will be better protected at the central office than at the individual stations, and that keeping them at the central office will not unduly interfere with audits of the stations."

Under the new provision (Amendment 185 to RO5C) each station's coupons attached to gummed sheets (form OPA R-120), showing name and address of individual station, must be kept in a separate envelope or folder bearing name and address of original station. This ration currency is not to be mingled with contents of another station's folder.

Dealers participating in the new system must also keep at each station a daily record of gasoline received, total gallonage value of ration coupons, military receipts, acknowledgments of delivery, and checks sent to central office, and the balance of the station account at the central office. Similarly, the central office is required to maintain parallel lists.

Tariff Commission Forecast of Postwar Consumption

	SHORT TERM POSTWAR CONSUMPTION		LONG TERM POSTWAR CONSUMPTION (1) Presupposing per capita income at 1939 levels			(2) Presupposing per capita income 75% above 1939 levels		
	% above 1939 level	in millions of bbls. (total) (annually)	% of consumption above 1939 level	in millions of bbls. (total) (annually)	Valued at	% of consumption above 1939 level	in millions bbls. (total) (annually)	Valued at
Gasoline	10-15	625-630	30-40	750-800	2.2-2.6 billion dollars	50-60	850-900	2.6 to 3.0 billion dollars
Fuel Oil	20-25	500-550	25-35	535-580	650-750 million dollars	"appreciably higher"	575-625	700-800 million dollars
Asphalt	"probably materially larger"	(no estimate given)	40-60	6.5 to 7.5 million tons	75-90 million dollars	"only moderately greater" —perhaps 10%	7.0-8.5 million tons	90-110 million dollars

Fireworks ON WHEELS

Marine fireworks on bloody Iwo Jima, as pyramids of projectiles rain death on Japanese emplacements. Rocket launchers are mounted on International four-wheel-drive trucks.
—Official U. S. Marine Corps Photo by S/Sgt. Rex M. Robbins.

AMERICA bounced back hard in this war against the Japs, and the boys who led the rebound were *United States Marines.*

From Guadalcanal to Okinawa the Marines have proved that boys from Kokomo, the Ozarks and the Bronx—when steeped in Marine Tradition, skilled with Marine training—are doggone good fighters. On beachhead after beachhead—then in jungle after jungle—they were far outnumbered by the Japs. But not outfought!

On they go, those Marines, on land and sea and in the air . . . outsmarting, outshooting, outkilling the enemy . . . till the Japs say "Uncle."

They have good equipment, sure. Most of the thousands of trucks they use, for example, are International four and six-wheel-drive military type vehicles built especially for the Marine Corps.

But proud as we are that Harvester has been able to make equipment rugged enough to fight with the Marines, we know that the real fighting machine in this march to Tokyo is the Marine himself. What a machine! All speeds forward . . . none reverse. Tough . . . rugged . . . smart. A superlative fighter. A superb citizen.

We proudly salute the boys from Kokomo, the Ozarks and the Bronx, who are *fighting* up to their glorious motto—Semper Fidelis.

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INTERNATIONAL *Trucks*

NPN Oil Marketer's Convention-in-Print

Mournful Talk on Postwar Jobs Plays Into Hands of 'Planners', J. Howard Pew Warns

Chairman Herb Taylor called to order the seventh session of NPN Oil Marketers Convention-in-Print with the following remarks:

SEVENTH SESSION
—o—
INDIANA NIGHT

LADIES AND GENTLEMEN — As our seventh session comes up, it brings us toward the end of the world's first oil marketers convention in print. Originally intended for six sessions, our final banquet will follow the 8th meeting, which will be president's night.

When we started this convention, we had no idea that it would develop into the proportions it has assumed. We could extend it indefinitely with the fine material we have on hand from not only the industry's leaders, but also the worried-looking little guys with problems who have taken the trouble to tell your chairman about them.

This week will be "Indiana Night." Phil Williams, George Hofmayer, Sam Hurd, and others in that state who take their conventions seriously really had an array of top notch speakers lined up when conventions were frozen. We used one of the talks last week, which was especially prepared by Studebaker's president Paul Hoffman in lieu of another he was planning for I.I.P.A.

This week our speaker is J. Howard Pew, president of the Sun Oil Co., who also took the trouble to sit down and prepare a talk for this session.

There are few people in this country who can read who have not followed Mr. Pew during this war in the statements he has made opposing international trade agreements or cartels as threatening our continued economic progress.

Mr. Pew belongs to the oil industry. He was born into it, and has been in it since leaving the Massachusetts Institute of Technology to join his father's company as an engineer in 1901. In addition to being first, last and always an oil man, he is a director of many large institutions. These include the Philadelphia National Bank, Crucible Steel, Sun Shipbuilding and others. He is also president of the board of trustees of the general assembly of the Presbyterian Church in the United States of America. He has been a director and active participant in the affairs of the A.P.I. since its founding. Mr. Pew.

MR. PEW — Gentlemen: On many sides today we hear a sad clacking of tongues over how tough competition is going to be in the oil industry after the war. If that means the clackers are afraid of peace—worried by "excess" productive capacity—haunted already by the day when Uncle Sam will stop being the biggest automatic customer the world has even seen—if that is what it really means, then it plays into the hands of the planners.

These planners even now are warning of "competitive chaos" in the postwar period and are ready with glittering schemes which they allege will remove all the competitive problems that you and I have faced for years and taken as a normal course of business. The price the planners would have us pay is the yielding of individual opportunity for each of us to advance, and eventually a lowered standard of living for our country.

Keep in Mind Fundamentals For Creating Useful Work

These same planners are placing great emphasis on postwar **jobs.** Business and industry are likewise concerned with maximum employment in the years following the war. In seeking that goal, however, we must not lose sight of the fundamentals of what creates **useful work.** Before this war every German and every Jap had a **job** created by totalitarian planning. But that same totalitarian planning was at the root of this war and today the German and Japanese people face years of misery.

I think Americans want more than jobs. They want the things that jobs produce—the good things of life. In other words, jobs are a means to an end. The end is our standard of living and that goes up when business and industry constantly produce better products and services at lower prices through an efficiency that reconciles a low-cost policy with the payment of high wages. The first requirement is that the productive efficiency of everyone engaged in business and industry continue at its highest level. It is only when the production of men can be profitably sold that they can be employed at high wages, and their volume of production depends on the boss of all business—the customer. Customers make jobs, not employers and not bureaucrats.

The competitive enterprise system in America, based on pleasing the customer, has provided greater incentive to economic and technological progress than any other system, and in a short period of little more than 150 years has given us the highest standard of living ever achieved by any country at any time in the world's history. I have a strong and fervent faith in the continuing superiority of our competitive enterprise system to expand our economy and to provide employment for all who are able and willing to work.

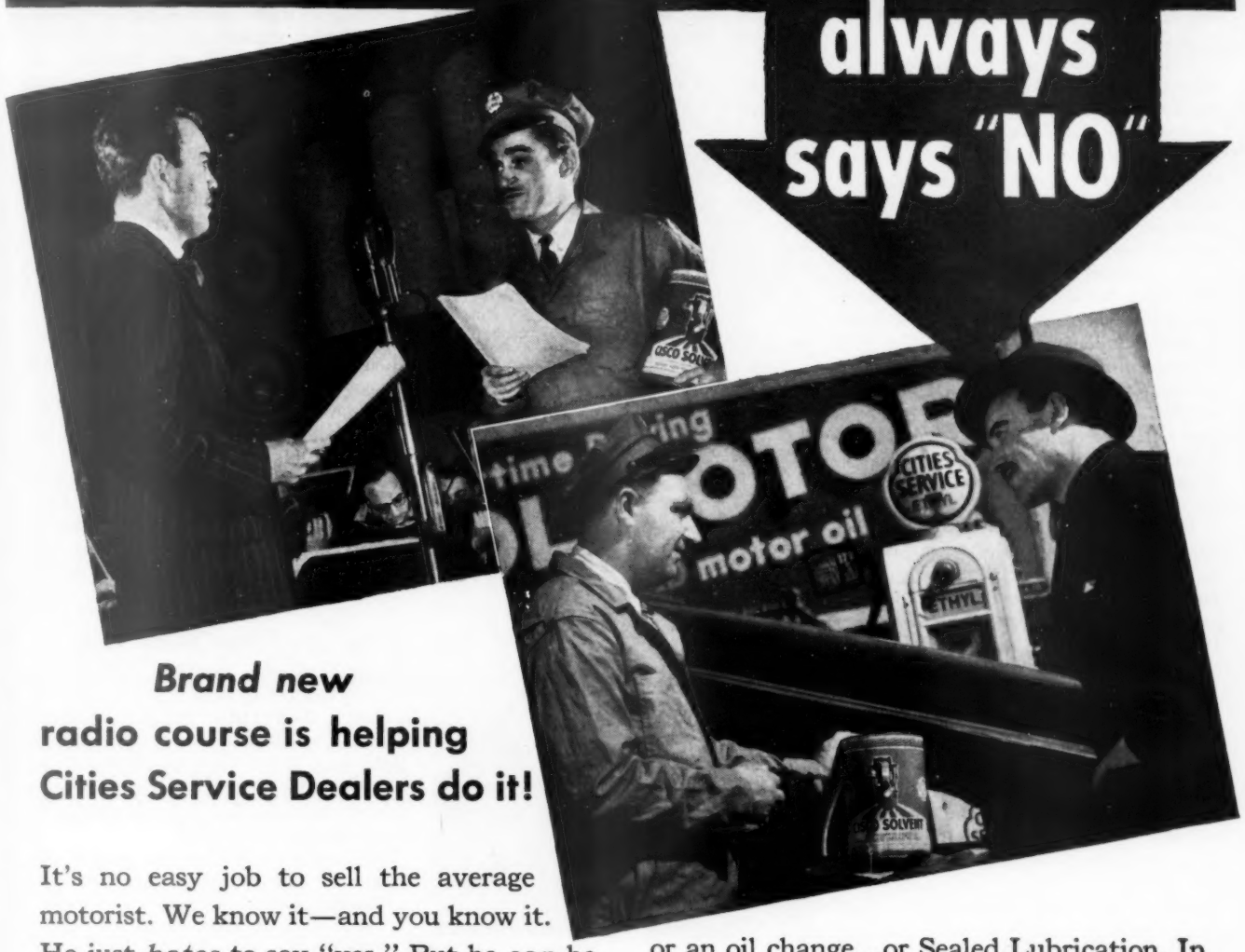
Such an expansion is essential to maximum postwar employment, yet at the very time that America is so concerned with this problem, we find a multitude of schemes advanced for regimenting our economic life—schemes which act to freeze economic activity.

Now, a super-state cartel seems pretty far from Indianapolis, and the business of the XYZ Oil Company there. But it is closer than a first glance might indicate. We are all too familiar with the NRA not to realize that State planning and regulation reach down into every nook and corner of the nation.

Likewise reaching down into the roots of our country is a new type of super-state cartel planning and regulation, on a grand international scale, that has emerged from recent trade conferences under the deceptive label of "trade accords". A super-state cartel is an arrangement, created by agreement or treaty between two or more governments, for restricting production, fixing prices, and/or allocating markets or sales quotas of one or more commodities in which their nationals deal in foreign trade. The original Anglo-American oil agreement established the framework for a typical super-state cartel.

The trend toward regimenting international trade under government control through these so-called "trade accords" constitutes, in my opinion, the greatest danger threatening economic progress in America. For international trade cannot be regulated and domestic trade remain

How to sell the fellow who always says "NO"



Brand new radio course is helping Cities Service Dealers do it!

It's no easy job to sell the average motorist. We know it—and you know it. He just *hates* to say "yes." But he *can* be sold... and we're showing *HOW* with our brand new network sales training course for Cities Service Dealers. *There's nothing like it on the air!*

Every Friday night, Cities Service re-enacts a scene that might have happened at *your* own service station. You'll hear the usual answers of a hesitant motorist... his arguments... his "maybe"... his "no." But you'll see how our dealer is equipped to work on him... break down his resistance... convince him why he needs Cisco Solvent... or an oil change... or Sealed Lubrication. In just two minutes' time, Cities Service Dealers learn plenty on how to make a sale. It's down-to-earth, hard-selling, money-making salesmanship. And it's working in scores of stations.... Cities Service Dealers report actual sales results, many new customers.

Don't forget!

Tune in on "Highways in Melody" every Friday night over NBC. It's a delightful half-hour road to real entertainment and *better* business.

"HIGHWAYS IN MELODY" FEATURES PAUL LAVALLE, HIS FAMOUS STRING ORCHESTRA AND CHORUS, AND THE CITIES SERVICE FAMILY OF GUEST ARTISTS.
NBC—8:00 P. M., E. W. T. . . . 7:00 P. M., C. W. T. . . . 6:00 P. M., M. W. T.

free. Once a government obligates itself to control the external business of its nationals, it likewise assumes an inherent obligation to see that there is a "fair and equitable" distribution of internal business.

Who shall participate in making up the export quota? Who gets hurt? Shall those who get hurt have a larger domestic quota? Will the **have's** keep what they have, and the **have-not's** be denied business because it would mean encroaching upon someone else's quota, even though they can supply an improved product at a lower price?

Every maximum quota finally resolves down into the question of who gets how much and where, and that brings us right back to Indianapolis. Does the XYZ company drill another well, build another service station, take on another industrial account, or doesn't it? The decision, under a free competitive system, is a function of private management; under a cartel system, the answer is dictated by the master planners.

This is not idle speculation, for under the treaty-making provisions of our Constitution the Federal Government has power to enforce its decisions and carry out the obligations imposed by any regulatory scheme set up in a treaty.

Industry's Voice Blunted Drive For World Cartel in Oil

During the controversy over the Anglo-American oil treaty it was reported that similar agreements covering 60 commodities were contemplated. If those plans are carried through, a large part of our economy will be enmeshed in a vicious cartel system. You and I can hardly raise an effective voice against the whole movement. But the unanimous protest of the petroleum industry *has* proven effective in blunting the drive for a world cartel in **oil.** Therein lies our duty—in our own field. The vigilance shown then in preserving in the oil industry the system that has been of greatest benefit to the public welfare must not be relaxed.

Edmund Burke, English statesman, warned as early as the middle of the 18th Century that "The true danger is when liberty is nibbled away, for expedients, and by parts." Continuance of Directive 59 and other wartime pooling and price-control regulations beyond the point of absolute military necessity would be such a dangerous expedient. I do not pretend that oil marketing will be a bed of roses after the war. On the contrary. But it is still easy for me to make a choice between the stiffest of competition and regimentation. I would relish the competition, and be thankful for it.

MR. TAYLOR—Thank you Mr. Pew. A great many thousand oil men will probably realize that a super-state cartel is closer to them than they may have thought after hearing your talk. I hope that those who would promote it will remember the power of outraged oil men when they really got mad about that fellow—what was his name? Oh, yes, Leon Henderson of the OPA. Your talk is certainly a serious one that deserves thought and study by every oil man. I see that we have right up on the front row, a fellow by the name of George H. Lilly. George has been monkeying around with the Hoosier Petroleum Co. of Indianapolis for a long time. I understand that in addition to doing pretty well for himself, George has also had a lot of fun as we go along this one-way street of life. George, could we have a few remarks from you, on any subject not too serious. Mr. Lilly.

MR. LILLY—On my way to the convention hall, I decided to stop at Room 1120. I just wanted to say "hello" to the boys. I used to be able to find a lot of the visiting firemen in there. It could have been that I might have been induced to take a small sarsaparilla if properly induced.

J. Howard Pew . . . deplores sad clacking of tongues

I knocked on the door with the old drum roll rhythm (you all know that pass knock). In a flash the door opened just as it had in the past.

But, lo and behold, there stood a WAC! I faintly remember her words, prior, that is, just before the door slammed in my face. Her words still ring: "The oil men are up in a meeting —this room has been taken over by the Army. It's out of bounds for civilians. Anyway we don't like wolves—and please stop bothering us" unquote.

With bowed head, I slowly made the long walk to the elevator. Past all the rooms so friendly and familiar in days gone by. Many a sip of soda pop I had guzzled in most every one of them.

Thoughts went buzzing through my head—the old days when 'gas' was poured into your auto tank through a funnel; a super deluxe service meant the pourer strained the gas through a chamois—on up to and through the Blue Eagle days when we cut out hours from way up there down to 48 or sumpin'—back to the days when I pipelined from Bradford to Stoy—the good old premium days when we gave a life-sized map of the state of Texas with each 5 gallons, and maybe threw in a quart of oil.

And now the war days when our time is taken by attendants interviewing us for jobs—how to cuddle those cute little ration coupons about us and quickly get them to the bank. And sometimes there is money to handle too—but not often. And now this convention—it's swell—it's tops, and a very good idea—and it has gone over big!

May the time come soon when we may invite you again to the Hoosier Convention where Sam Hurd presides at the "Thought of the Day" session, and liquid refreshments lend spirit to the occasion.

H. N. (Dynamo) Mace Talks About His New Wartime Ventures

MR. TAYLOR — Thanks, George. Texaco's Dick Guy was telling me a little joke about you. He knows a lot of them, but since he has become a district manager he has become a bit more serious.

Anyhow he said that you went to the bartender and ordered sarsaparilla.

"Sorry no sarsaparilla."

"Well, make it Coca Cola."

"We're out of Coca Cola."

"Okay, let's have a root beer."

"No root beer."

"All right. Gimme a double scotch and soda—God knows I asked for a soft drink."

I see that we have a great many Indiana oil men with us. One of them is my old friend H. N. Mace, of Mace Service, Inc. at Terre Haute. A couple of years ago I wrote a story about this live-wire organization. I had a hard time keeping up with Herb Mace, who was a little dynamo on wheels. He was running around with a Kiplinger letter in one hip pocket and an Oilgram in the other, and directing the operations of the fastest moving bunch of Hoosiers I have ever seen. How's business, Herb?

MR. MACE—When you were in Terre Haute in 1942, I was in the midst of trying to assimilate the new activities which war and rationing caused me to think necessary to keep sales up and enable us to have security during the war period.

Well as new ventures I took on furniture, paint, general auto repairing, feed,

CONSTANT *and* INVARIABLE

This war-born, blended, multi-protein foaming agent for highspeed extinction of gasoline, oil and other serious fires—*has military experience only!* Used extensively by the U. S. Navy for preparedness—and for quickly extinguishing fires on shipboard and at shore bases, MEARLFOAM-5 is the veteran of many successful engagements.

This effective multi-protein foaming agent works with maximum efficiency in any climate or atmospheric condition. It is a good mixer—with any type of water: sea, fresh . . . hard, soft. Whatever the temperature of air and water, the highspeed extinction qualities of its foam are constant and invariable.

MEARLFOAM-5 yields the live, lasting foam with the tough, elastic water-retaining film. When split-seconds count—you can rely on MEARLFOAM-5 to put fire out fast—keep fire out, *permanently!*

Completely safe and non-corrosive—may be used with standard Mechanical Foam-Forming Equipment

FOAM ON FIRE OUT... Stays OUT!

THE MEARL CORPORATION
153 Waverly Place, New York 14, N.Y.

tire recapping and farm implements. Some of the things which Henderson—

MR. TAYLOR—Who is Henderson?

MR. MACE—Oh you know Henderson. Leon Henderson. That fellow that your boss, Warren Platt, took out after when he started covering too much territory as head of OPA.

MR. TAYLOR—Pardon me, go ahead with your talk, Herb.

MR. MACE—Well, as I said, some of the things which Henderson predicted did not happen. So I soon dropped the furniture line, as it fitted in the picture the least, anyway. We have done only a fair job with paint, but the income from the other departments have helped us a great deal.

We have had a nice steady sales increase each year since you were here. We are in better position to compete after the war is ended, because we are better diversified, and expect to have considerable sales increase then, which should more than offset the expected negative factors of increased sales expense and decreased mark-up on retail items.

I feel sure, having tried it both ways, that most independents would be better off in adding new departments rather than more outlets, to increase sales. We have benefitted by not "having all our eggs in one basket" in our oil sales department. Our petroleum sales are fairly well divided between controlled stations, the farm trade, sales to coal mines, and sales from company owned accessory trucks.

Harry Lynch Gives Views on Credit Cards and Accessories

MR. TAYLOR — Thank you, Herb. Those words from one of Indiana's most successful jobbers who started on a shoestring really should mean something. I believe that Harry E. Lynch, of the Lynch Petroleum Co., Pueblo, Colo., has some thoughts on accessories, credit cards and the like. Mr. Lynch.

MR. LYNCH—A large number of us independent jobbers and marketers contemplate stocking "outside merchandise", such as refrigerators, radios, washing machines and like articles after this war is settled, or when such items are again placed on the available list.

However, I wonder if much thought has been given to the fact that all of these items will require more or less service. And the purchaser always looks to the seller for such service and rather expects same. Will it be profitable for ourselves to stand the extra costs of maintaining such a department and keep men to do this work, much of which will be gratis, in order to maintain good will? This has been somewhat experienced in the past with sales of oil burners and heating equipment.

Also, there is the matter of credit, or installment payments to be considered. Most of us are familiar with the abuse of the credit cards previously in effect and which I, personally, do not care to see established again.

We will have about the same trouble in selling this "outside equipment" because of such sales on installment basis made by the mail order houses, chain stores, and the local hardware or furniture dealer. Of course these firms maintain a department for the handling of the payment plan. But will it be profitable enough for us oil marketers? Petroleum products are our main items of sale. Can we afford to install a repair department and an installment payment department in our business because of the sale of a few refrigerators, washing machines, radios or such items?

George W. Hofmayer . . . livewire secretary of the Indiana Assn.

MR. TAYLOR—Thank you Mr. Lynch. You bring up some very interesting questions. In my travels around the country I have seen a lot of oil marketers who have made money with these outside lines. A good example is the Mace Service of Terre Haute. Mr. Mace not only sells anything that he finds profitable, from Easter lilies to bulldozers, but also maintains a complete service and credit department of his own. And by his own testimony, he didn't have a dime to start with. Watch for feature stories on this subject in future issues of National Petroleum News.

Ladies and gentlemen, there is something wrong going on. Apparently a bunch of school boys have gotten into the wrong meeting. Pardon me while I straighten this out.

Say, young fellow, what is your name —and what are you doing in this meeting?

"YOUNG FELLOW"—My name is R. G. Clark. And I am not quite as young as you think, Junior Taylor. I'm president of the Old Timers Club. And now that you have brought up the subject, I'm going to tell you all about it.

The Old Timers Club was organized at Hotel Severin, Indianapolis, on Oct. 12, 1941, just one month and a few days before the soft easy words of the now expelled Kuiaka Koiso "So Sorry," for one of the most inhuman and barbarous tricks in the history of mankind—the bombing of Pearl Harbor.

After this disastrous blow to the old U. S. A., it was obvious that clubs and conventions would be just a memory in a short time. That was true of the Old Timers Club. I shall never forget the enthusiasm displayed by that group of charter members. The news of the founding of this club was so well received that members were coming in from coast to coast, and from the Gulf to Canada. Many of our members answered the call for military service. others sent sons to foreign lands. All thoughts of clubs and highlife parties faded as it should, and we got down to the business of winning the war.

As this story is being written today, we can see behind the clouds the sun is still shining at least for those of us that have so far been spared the sorrow and grief of receiving those words "Your Government regrets".

Hopes Old Timers Can Stage A Happy Reunion Very Soon

As the president of the Old Timers Club, I sincerely pray that these government telegrams will not be in order in a very few weeks, and that our members, and sons of our members, will soon return, and that we can revive the true Old Timer spirit, and hold one big happy reunion. We will then need each other as never before, and we will need this gathering to help heal the scars of war.

Just as soon as the last shot is fired, I am looking forward to calling all members back to the Severin. We hope to see many new faces in our membership list. The Old Timers Club was organized with only one thought in mind. That thought was to form a united fellowship within the petroleum industry, and to help each other. Join us. We will show you what we are trying to do. If you have been in the petroleum business, or any allied industry for 10 or more years, we want you for a member.

Should you be interested, just drop a card or letter to the office of the Indiana Independent Petroleum Assn., Suite 1404, 108 East Washington St., Indianapolis. Ind.

MR. TAYLOR—Thank you Mr. Clark. I hope you get many thousands of new members. It's too bad that Sam Hurd is too young to qualify for membership. Or did you lower the age limit and let him in? Seems that I remember about

Sam having something to do with your organization.

I see that our old friend R. L. Mitchell, president of the Spartan Petroleum Co., Inc., Spartanburg, S. C., is with us. He doesn't seem too happy about something. Could we have a few words from you, Mr Mitchell?

MR. MITCHELL — The main thing I am interested in is doing away with having to get permits to ship products from the Southeast and all the red tape that goes with it. I would also like to see OPA abolished.

MR. TAYLOR — Quiet, gentlemen, please, quiet! All right Mr. Mitchell, go ahead.

MR. MITCHELL—OPA has been one constant source of trouble to my dealers ever since it went into effect. In other words, I feel that it is time now for the Government to get out of the oil business. There is a great deal more that I would like to say. But I feel that it is best left unsaid.

MR. TAYLOR — Thank you, Mr. Mitchell. I see that we have a gentleman who wishes to make some remarks, but I don't seem to recognize him. The chair recognizes you, sir.

Louis Allen Doubts the Need For Rationing in U. S.

MY NAME IS LOUIS I. ALLEN— I am a marketer in Brattleboro, Vt., and I have a few remarks to add to those of Mr. Mitchell.

In the first place, I don't believe in rationing in a country of plenty such as our supply is today.

Two years ago Mrs. Allen and I had the pleasure of going through Longview, Texas. When we saw all the oil pumps that were not working, it seemed just too bad when so much good could be done by selling products and getting revenue and taxes which would help to keep the costs of the government down, if they would let men purchase same and sell.

I certainly agree with everyone else that this war should be won. And I want to do my share in helping. But it does seem as though, from what I read and have seen, in this state that there could have been a different management for this land of plenty and free people.

MR. TAYLOR—I see that we have H. H. Wood, the Gulf man at Elkhart, Ind., with us. Perhaps Mr. Wood would like to make a few remarks to his fellow Hoosiers and the rest of the convention.

MR. WOOD—I'm no speaker. Just an ordinary oil man. But if you have any questions to ask me, I'll try to answer them.

MR. TAYLOR—All right, Mr. Wood, er—what about tire recapping? Do you think it is here to stay?

MR. WOOD—It is very hard to determine. People seem to forget so easily. We expect big sales when new tires are released. Most recapped tire walls are getting very flimsy. We think this situation will stick in the minds of users. I do not own recapping equipment, but have a tieup with local recappers, and find that it pays quite well.

MR. TAYLOR—That's interesting. I am particularly interested in that subject, because recently in NATIONAL PETROLEUM NEWS readers were brought up-to-date on this subject (*see NPN, Feb. 28, p. 20*). This followed a number of articles on the subject which appeared in NPN at the beginning of the war. But I have some notes here on some of the people I have talked to recently on the subject.

Associated Service Co. of Indianapolis contract with other recappers, and definitely think the business is here to stay. **Abshire Oil Co.** of Goshen, Ind., handle their recapping the same way, and agree that it has a future for the independent marketer.

C. B. Parrish, general manager of **Glenn Oil Co.**, reports that one of their new services is a tire recapping plant at a central station to care for the business of that company's other outlets. **Joseph Anderson, Eastern Indiana Oil and Supply Co.,** Geneva, Ind., acts as an agent for a nearby recapper.

He thinks the business is here to stay, but not on such a large scale of operation.

Picking a few others at random across the country, among those definitely expressing a view that the recapping business is here to stay, and offers an opportunity for future marketing operations are: **R. E. Taylor,** Winston Salem, N. C.; **J. P. Finnegan,** Morristown, N. J.; **William M. Hood,** Tucson, Ariz.; **J. W. Harsha,** West Union, O.; **Queen City Oil Co.,** Cincinnati; **E. S. Holten,** president, **Barnstable and Holten,** Chetek, Wis.; **Strocks Oil Co.,** Wooster, O.; **Grenhom Service Stations,** Indianapolis, who say they expect to put in their own equipment when manpower becomes available;

Viking Oil Co., Coleraine, Minn.; **J. L. Baxter,** St. Cloud, Minn.; **Lutz Yelton Oil Co.,** Shelby, N. C.; **Lewis Oil Co.,** Palco, Kans.; **John Klay, Parks Klay Co.,** Lima, O.; **Quality Oil Co.,** Winston Salem, N. C.; **Neverman Oil Co.,** Menominee, Mich. (for some time after the war anyway); **Midwest Service Co.,** Algona, Ind.

Bulk Plant Operators Ruled Contractors by U. S. Court

NPN News Bureau

CLEVELAND—The U. S. Circuit Court of Appeals, sixth district, has held that the Standard Oil of Kentucky's bulk plant operators are independent contractors and excluded from the Social Security Act.

Emphasizing that the company did not attempt to control the details and means by which the commission agents secured a satisfactory volume of sales, the court said: "... it is remarkable that in some instances, the commission agents sold and distributed commodities of other producers, competitive with the company's products."

Standard of Kentucky filed action to recover from the Collector of Internal Revenue, certain taxes for the years 1936 to 1940, inclusive, claimed to have been erroneously assessed and collected under provisions of the Social Security Act. The district court for the Western District of Kentucky entered judgment for the company, which the internal revenue collector appealed.

Gambill Plans Expansion Of Recapping Service

Gambill Oil Co., No. Wilksboro, N. C.; **Edgar E. Denton,** Westfield, N. Y., who has an order placed for new molds to add to his four tire curing molds and five section curing molds; **Torrington Coal & Oil Co.,** Torrington, Conn.; **J. E. Colun,** Jesup, Ga., who says, very definitely, "yes;" **Siebing Oil Co.,** Alexandria, Minn.; **Adams Oil Co.,** Simpson, Kans.; **Interstate Oil Co.,** Montgomery, Ala.; **Philip Page, Alpena Oil Co.,** Alpena, Mich.; **Else Oil Co.**, Oxonia, Wisc.; **Nat Watson,** Greenwood, S. C.; **C. S. Schlank, Apex,** N. C.; **G. F. Taylor,** Somerville, N. J.; **R. A. Luhman,** Detroit, Mich.; **J. M. Linnau,** Buffalo, N. Y.; **A. J. Bivens,** Pawtucket, R. I.

However, not all marketers, by a jugful, believe that tire recapping is here to stay. Although a little better than 60% of those expressing themselves definitely believe in recapping as a permanent affair, there are many others who flatly fail to see much of a future to it. Many think it will last for a few years, others see it good for truck tires only, and many others have simply not made up their minds.

Picking a few at random who say that tire recapping is not here to stay: **Elk Filling Corp.,** Buffalo, N. Y., expresses the opinion that postwar business will be much smaller than the present volume; **Costner Oil Co.,** Lincolnton, N. C., believes the business will fall off almost completely after the war, for a time, at least; **Kimmel Oil Co.,** Hiawatha, Kans., thinks the business will stay all right, but in less volume and at less profit; **Lucy C. Lenz,** manager of **Stroud-Doyle Co.,** Oshkosh, Wis., as soon as rubber becomes available, tires reasonable in price, and long motor trips can be made, the business will more or less play out.

Howard Bros. Oil Co., Alpena, Mich.,

(*Continued on p. 38*)

This is the second of a series of three advertisements discussing the economics of postwar remodernization

HOW MUCH IS ENGINEERING SERVICE WORTH?

Continuity of Operation is a Good Pay-Off Index!

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COST ACCOUNTANTS' reports to refinery managements on shutdowns present their own challenge to the profit side of the ledger.

For instance—on a 15,000 bbl. catalytic cracking unit—if management can eliminate just one 30-day shutdown period in a calendar year . . . *it means adding more than a quarter of a million dollars to operating income.*

From this angle, the operational record on Kellogg-built plants acquires special significance. To date . . . the latest Kellogg *Fluid* "Cat-Crackers" have now passed the phenomenal *continuous* "on stream" time of 300 consecutive days . . . and there is no indication yet as to when it will be necessary to interrupt production.

Here, you have still another reason why M. W. Kellogg so often gets the job. For a Kellogg "job" means more than superior process design . . . more than specifications that cross the t's and dot the i's with exactitude. Every Kellogg job draws on the cumulative experience of our complete★ service.

The net advantages of that experience show up not only in stepped-up production figures, but also in lower maintenance charges. This efficiency defines the economic "plus" that this company adds to the usual services of the engineer-contractor.

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LABORATORIES – fully equipped and staffed – devoted exclusively to chemical engineering and process development.

24-HOUR-A-DAY PILOT PLANTS – 17 refining processes operating continuously–providing accurate data for commercial scale application.

EXCLUSIVE CHEMICAL ENGINEERING DATA – Continuously compiled . . . embracing both pilot plant runs and the operation of Kellogg-built refineries. Data extends from beginning of modern refining.

PROCESS ENGINEERS – Specialists who have continuously made major contributions to oil refining development, for more than 20 years . . . currently exemplified by their work on fluid catalytic-cracking.

MECHANICAL ENGINEERS – Kellogg installations – worth hundreds of millions—are their best reference.

METALLURGICAL LABORATORY – Establishes continuous check of specifications...creates new techniques for the fabrication of refining equipment.

PERMANENT CONSTRUCTION CREWS – Geared to function all over the world on single units or multiphase refineries . . . team-experience cuts costs, speeds construction.

OPERATING STAFFS – Specialists at placing new units "on stream"... training of refiner's own operating crews.

LICENSING SERVICE – Licenses available through Kellogg as Licensor or licensing agent for all types of refining processes.

ECONOMICS CONSULTATION – Offers oil companies the opportunity to have their overall operations reviewed and evaluated by personnel with authoritative and extended experience in the field of petroleum economics and management.

REFINING NEWS and TECHNOLOGY

Map Strategy on Fund Increase For Synthetic Fuels Program

WASHINGTON—Rep. Randolph of West Virginia rose in the House this week during debate on the Interior Department's appropriation bill to laud the Bureau of Mines synthetic fuels program, but decided to leave to the Senate consideration of an increase in money when the measure reaches that body.

Compared with a request for $13,000,000 by the Bureau to carry on the program during the next fiscal year, only $6,000,000 was recommended by the House Appropriations Committee.

The West Virginian told NPN that he had talked over the matter with Senator O'Mahoney of Wyoming, who suggested that action to increase the synthetic fuels program budget await consideration of the bill by the Senate, where, he thought, such a request would stand a better chance of approval.

The strategy, apparently, will be for Sen. O'Mahoney, when the Senate considers the measure, to attempt an amendment calling for $25,000,000 to expand the synthetic program during the twelve-months period following July 1. If the Senate approves, it is felt that the Bureau will receive at least $13,000,000—its original request—when House and Senate members meet in conference to iron out differences between the two houses.

Leonard Refineries to Put Up Cat Cracker for Base Stock

ALMA, Mich. — Completion of plans for a catalytic cracking unit for the production of 100-octane aviation gasoline base stock has been announced by Reid Brazell, president of Leonard Refineries, Inc.

A Houdry Corp. Thermofor catalytic cracking unit will be used, and the design, engineering and construction work will be done by the Lummus Co.

Final plans for the new work were approved by directors April 20, Mr. Brazell said. The project is to be financed by company funds, he added, and will require practically no changes to convert to the production of high-octane motor fuel later.

MPR 88 Revision on Diesel and Tractor Fuels Up to Midwest Industry, With OPA Ready to Help

NPN News Bureau

CHICAGO—The proposed amendment to MPR 88 covering delivered-at-destination prices on Diesel and tractor fuels in the Midwest, which has been under study for some time, is ready for final industry approval and is now being circulated among refiners and other suppliers for their reaction before issuance by OPA.

Essentially, the proposal follows the principle of previous amendments covering gasoline, kerosine and burning oils to effectuate delivered-at-destination ceilings figured on a Group 3 basis. However, a significant difference occurs, OPA Price Executive Eugene D. Uman said in a letter accompanying the proposed amendment, the circulation of which is directed through W. J. Carthaus, D & M subcommittee chairman, in that this amendment attempts to reach a common basis of naming and grading products as well as establishing ceilings. However, with industry concurrence, he said, OPA is agreeable to working out the problem.

The industry is asked to study the proposed amendment and submit its reactions to Mr. Carthaus by May 8, so that, if acceptable, the regulation may be made effective as soon as possible. The proposed amendment is quoted below:

Proposed Amendment to Maximum Price Regulation No. 88

Section 5.1 (e) (4) is added to read as follows:

(4) **Diesel Fuels and Tractor Fuels.** In the above states (except in the Southern Peninsula of Michigan in the Metropolitan Chicago area as said area is defined in Section 5.1 (e) (l) (iii) above), a supplier's maximum delivered-at-destination tank car prices (exclusive of any applicable taxes incident to the sale, but not the transportation, of such products) for Diesel Fuels and Tractor Fuels of the grades hereinafter referred to shall be as set forth below, except that the sum of .125c per gallon may be added by an eligible marketer.

(i) Tank Wagon Resellers; Contract Buyers. If on Oct. 1, 1941 there was a written contract in effect extending over a period of not less than one year for deliveries by a supplier to a tank wagon reseller, then the particular supplier's maximum delivered-at-destination price to such reseller shall be determined in accordance with the provisions of Section 5.2 and Article VI, or shall be established pursuant to Section 8.3.

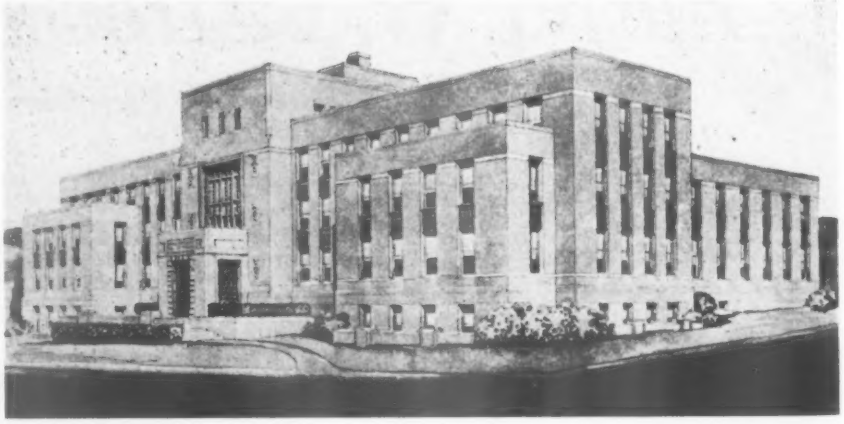
(ii) Consumers and Tank Wagon Resellers. If (i) is inapplicable, any supplier's maximum delivered-at-destination price for any of the products listed below (exclusive of any applicable taxes incident to the sale but not the transportation of such products) shall be the rail rate of transportation for the product as of Oct. 1, 1941 from Tulsa, Oklahoma to the particular destination, plus the amount designated below for the particular product:

Product	Cents Per Gallon
Diesel Fuels (Distillate)*	
Diesel Index 56 and above or 50 cetane and above	4.125
Diesel Index 45-55	4.00
Diesel Index 44 and below	3.625
Tractor Fuels†	
Gasoline Type (volatile)	5.00
Distillate Type (non-volatile)—40 octane A. S. T. M. and above	5.00
Distillate Type (non-volatile)—30-39 octane A. S. T. M.	4.625

* These maximum prices apply only to Fuels sold for use in Diesel engines.

† For grades of Tractor Fuel other than those listed, maximum prices shall be established pursuant to Section 8.3 of this Regulation.

Proposed B. of M. Oil Shale Lab at Wyoming U.



Shown here is an architect's sketch of the proposed $534,000 research and development laboratory to be erected on the University of Wyoming campus at Laramie in connection with the Bureau of Mines synthetic liquid fuels program. Construction is to start at once and it is slated for completion by the end of the year. Methods of reclaiming oil from shale will be tested here and processes developed will be tested in a demonstration plant near Rifle, Colo. (See NPN, April 25, 1945, p. 3)

Ed Hanlon's first "Natural" plant built in 1908, was the forerunner of pioneering in the development of motor fuels that were partners with the automobile in making possible modern transportation, contributing much toward the Victories of two World-Wars . . . with the experience of the past, STA-VOL-ENE the "Natural" known throughout the World, will contribute much to the many new developments forecast for tomorrow.

Hanlon-Buchanan Inc

PIONEER NATURAL GASOLINE MANUFACTURER

EXPORT TERMINALS
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NATIONAL BANK OF TULSA BUILDING
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Cable Address — STAVOLENE, Tulsa, U. S. A.

Refining News and Technology

Midwest Crude Sharing Is Down a Trifle

NPN News Bureau

CHICAGO—Dist. 2 PAW has authorized the sharing of 13,400 b/d of crude, produced by 14 Midwest refiners and to be shared with 12 other refiners during May, was disclosed in the crude oil supply list issued by PAW. This is a decrease of 1855 b/d under the 15,255 b/d April figure.

The sharing will bring refiners' runs up to the minimum 70% for non-war plants and a 90% minimum for war plants. Non-war plants are being urged to use West Texas crude to bring their runs up to normal PAW allotments.

The schedule of crude for May is as follows:

Supplying Co.	Receiving Co.	b/d
Pure Oil Co.	Crystal Ref.	250
	Midwest Ref.	750
	Old Dutch Ref.	200
Ohio Oil Co.	National Ref.	2000
Champlin Ref.	Kanotex Ref.	1200
Continental	Kanotex Ref.	750
Shell Oil Co. Inc.	El Dorado Ref.	1500
Standard Oil (Ohio)	El Dorado Ref.	750
Texas Co.	Advance Ref.	500
	Stoll Oil & Ref.	250
Magnolia	Cascade Ref.	550
Sinclair	National Ref.	1000
Rayburn	Crystal Ref.	200
	Marvel Ref.	150
Gulf Refining	Louisville Oil & Ref.	750
Naph Sol	Crystal Ref.	200
Standard Oil (Ind.)	El Dorado Ref.	1000
	Advance Refining Co.	1000
Allied Oil	Pana Ref.	400
	Total	13,400

Blast in Surge Drum Rocks Shell Butadiene Plant

NPN News Bureau

LOS ANGELES — Fire which followed an explosion swept through the Shell Oil Co.'s $20,000,000 butadiene plant here last week and injured three employes.

The explosion, which rocked houses within a radius of 15 miles, occurred in a "surge drum" containing 400 bbls. of butadiene and probably was caused by a gas leakage ignited by the boilers, Plant Manager E. S. Brodine said.

The plant is owned by the Defense Plant Corp. and operated by the Shell Chemical Division of the oil company as one unit of a system producing a large share of the nation's synthetic rubber. The plant was back in operation within 24 hours.

Mines Bureau Predictions Keep Crude Demands Near Record

NPN News Bureau

WASHINGTON—The average amount of domestic crude needed to meet demand in May is estimated at 4,812,900 b/d, up 248,900 b/d or 5% from actual demand in May, 1944, the Bureau of Mines announced this week.

At the same time, the Bureau said that current data for March and first half of April indicated approximate demand of 4,750,000 b/d, or "somewhat less than amount forecast for that period." Crude consumption averaged 4,696,000 b/d in January and rose to a new record of 4,822,000 b/d in February.

Average demand for domestic crude in first quarter of 1945 is expected to approximate the 4,755,000-b/d rate achieved in fourth quarter of last year.

Another Bureau prediction is that there will be a gain of about 7.9% in crude production and of 8.5% in total crude runs for first quarter of 1945 compared with same period in 1944.

Recent Patents

April 24, 1945

PROCESSES

Conversion of hydrocarbons. Richmond T. Bell, Deerfield, Hillis O. Folkins, Shokie, and Charles M. Thacker, Highland Park, Ill., assignors to Pure Oil Co. Filed April 10, 1943. No. 2,374,167.

Catalytic conversion of hydrocarbons. Robert E. Burk and Everett C. Hughes, Cleveland Heights, Ohio, assignors to Standard Oil Co. (Ohio). Filed March 23, 1939. No. 2,374,175.

Hydrocarbon conversion. John A. Anderson, Chicago, assignor to Standard Oil Co. (Ind.) Filed July 31, 1942. No. 2,374,262.

Olefin polymerization process. Morris T. Carpenter, Chicago, and Charles F. Feuchter, Hammond, Ind., assignors to Standard Oil Co. (Ind.) Filed Aug. 21, 1937. No. 2,374,272.

Treatment of hydrocarbons. Preston L. Veitman, Beacon, N. Y., assignor to Texas Co. Filed Jan. 8, 1942. No. 2,374,313.

Conversion of hydrocarbons. George S. Dunham, Merion, Pa., assignor to Socony-Vacuum Oil Co. Filed Aug. 9, 1941. No. 2,374,338.

Catalytic conversion of hydrocarbons. Jacob E. Ahlberg, Chicago, assignor to Universal Oil Products Co. Filed Jan. 8, 1940. No. 2,374,404

Hydrogen halide recovery. Theodore W. Evans, Oakland, and Harry de V. Finch and George W. Hearne, Berkeley, Calif., assignors to Shell Development Co. Filed April 28, 1942. No. 2,374,476.

Removal of organic radicals from n-substituted ureas. Vernon E. Haury, El Cerrito. Calif., assignor to Shell Development Co. Filed April 10, 1944. No. 2,374,485.

Hydrocarbon conversion. Walter A. Schulze, Bartlesville, Okla., assignor to Phillips Petroleum Co. Filed May 8, 1942. No. 2,374,507.

Effecting catalytic reactions; John D. Upham, Bartlesville, Okla., assignor to Phillips Petroleum Co. Filed April 9, 1943. No. 2,374,511.

Catalytic process. I. Louis Volk and Thomas H. Whaley, Bartlesville, Okla., assignors to Phillips Petroleum Co. Filed April 9, 1943. No. 2,374,518.

Alkylation of aromatic hydrocarbons. Vladimir N. Ipatieff and Louis Schmerling, Riverside, Ill., assignors to Universal Oil Products Co. Filed May 13, 1943. No. 2,374,600.

MISCELLANEOUS

Toxicant petroleum products. Vladimir L. Shipp, New York, and Arthur C. Pabst and Robert B. Killingsworth, Douglaston, N. Y., assignors to Socony-Vacuum Oil Co. Filed Feb. 6, 1943. No. 2,374,387.

Fractionating apparatus. Wallace A. McMillan, Glenham, N. Y., assignor to Texas Co. Filed Oct. 5, 1940. No. 2,374,549.

Lubricating oil. John R. Morris and Rush F. McCleary, Beacon, N. Y., assignors to Texas Co. Filed April 26, 1941. No. 2,374,559.

Rust preventive compositions. Harry Roden, Port Neches, Tex., assignor to Texas Co. Filed May 31, 1941. No. 2,374,565.

Compiled by R. E. Burnham, patent and trade-mark attorney, 511 11th Street, NW, Washington 4, D.C., from whom copies may be obtained at rate of 25c each. State number of patent and name of inventor when ordering.

Davis, Biddle, Kettering To Study Patent System

NPN News Bureau

WASHINGTON — A four-man committee under Economic Stabilizer Davis this week was appointed by Secretary of Commerce Wallace to study the U. S. patent system and make proposals for legislation to curb their alleged misuse in supporting unlawful monopolies.

Secretary Wallace's action followed receipt of a letter from President Truman which urged him to undertake the study in co-operation with heads of other government agencies, because "much has lately been said and written to suggest that the patent statutes do not in all respects serve the constitutional purpose to promote the progress of science and useful arts, and that patents have been misused to support unlawful monopolies in contravention of the purposes of the anti-trust laws."

Invited to serve on the committee, besides Mr. Davis, were Attorney General Biddle, Dr. Charles F. Kettering, chairman of the National Patent Planning Commission, and Dr. Vannevar Bush, director of the Office of Scientific Research and Development.

Mr. Wallace said he hoped the committee would submit its recommendations to him by June 30.

Crude Stocks Show Increase

NPN News Bureau

WASHINGTON — Domestic and foreign crude stocks totaled 221,929,000 bbls. at the close of the week ended April 21, up 1,905,000 bbls. from the previous week, Bureau of Mines announced.

There were increases of 1,584,000 bbls. in stocks of domestic crude and of 321,000 bbls. on foreign crude. Heavy crude stocks in California totaled 5,789,000 bbls., up 89,000 bbls. from the preceding week.

Joins Group to Survey Effects of Bombing

NPN News Bureau

TULSA—Robert P. Russell, president of Standard Oil Development Co., has been named a member of a nine-man civilian committee to appraise results of strategic air bombing in Europe, the War Department announces.

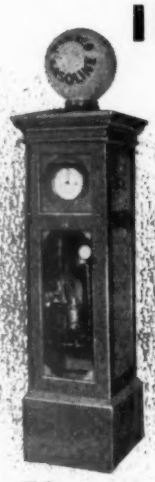
The new committee, known as the U. S. Strategic Bombing Survey, will analyze the effect of air bombardment on the will and capacity of the enemy to resist. Information will be gathered with the aid of the military services by means of field operations throughout the European battle areas.

Findings of the bombing survey are expected to aid in the war against Japan, and will provide valuable data in studying the potentialities and future development of the U. S. air power.

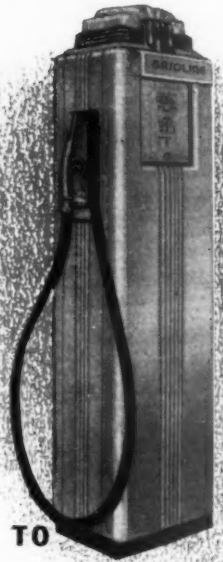
Experience for Sale...

PITTSBURGH HAS ALWAYS LED THE WAY TO BETTER METERS IN SERVICE STATION PUMPS

FROM
METERED VISIBLE PUMPS



TO
METER DIAL PUMPS
(EARLY TYPE)



TO
DISPLACEMENT METERED COMPUTERS

?

TO
ARTIST'S CONCEPTION OF HOW A POST-WAR SERVICE STATION PUMP MAY LOOK

The evolution of the meter pump can be readily traced from its inception through successive design advances by charting meter developments that were either originated or perfected by the Pittsburgh organization. A meter pump can be no better than the meter upon which accurate, unfailing measurement depends. In meter design and manufacture there can be no substitute for experience. Pittsburgh designed the first successful meter for gasoline dispensers. When higher measurement standards were needed, Pittsburgh Piston Meters, *positive displacement type*, were brought out. These, in the number of over 140,000, were built into computer pumps made by leading manufacturers prior to Pearl Harbor.

In the future, as in the past, the Pittsburgh organization will continue to serve the pump industry with accurate, dependable, long-lived meters . . . improved meters that our war-time experience in design, materials, and manufacture will make even better than those produced in the past.

PITTSBURGH PISTON METERS

MAKE GOOD SERVICE STATION PUMPS BETTER!

PITTSBURGH EQUITABLE METER CO.

Atlanta Houston **MERCO NORDSTROM VALVE CO.** Los Angeles Boston
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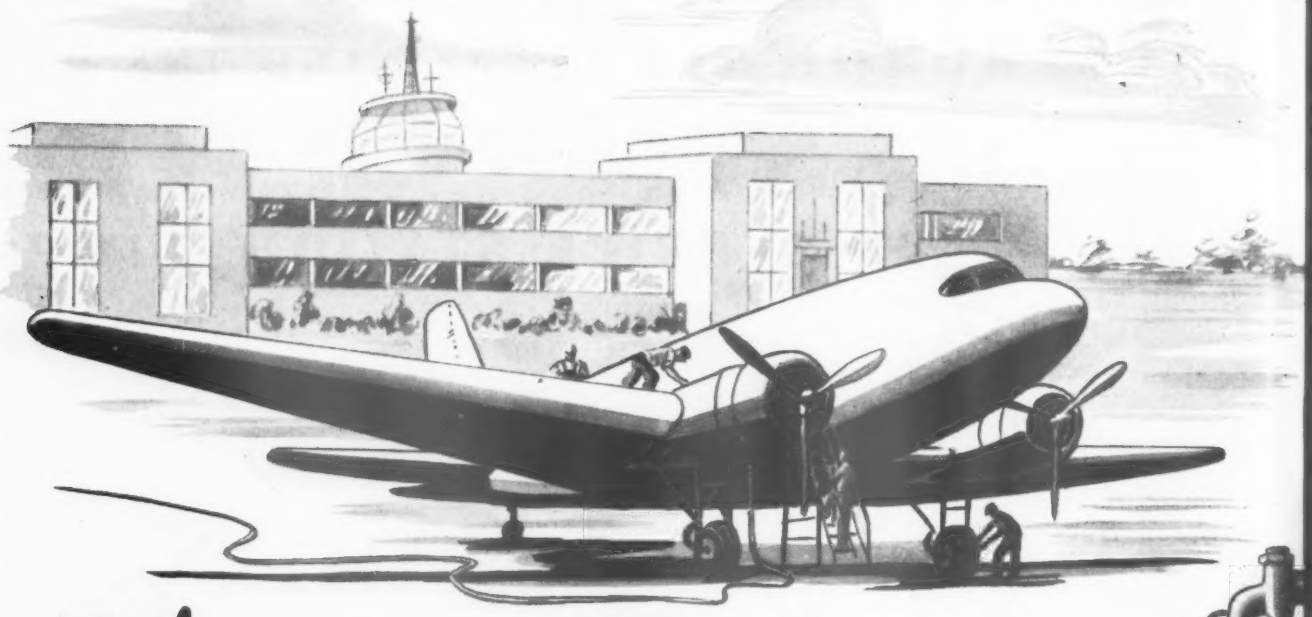
PITTSBURGH-EMPIRE *Meters*

MANUFACTURERS OF THE MOST COMPLETE LINE OF PETROLEUM METERS IN THE WORLD

IMPORTANT DEVELOPMENTS FO T



Wayne Refuelers

ARE post-war airplane refueling problems puzzling you? Wayne may provide some of the answers. In the line now developed Wayne will offer every facility for the safe, accurate, speedy service of any type or size of airplane in one or more of the new Wayne Refueling Systems. They will be available as soon as wartime restrictions are lifted. There will be "packaged units" complete with pump and meter for tank trucks, all ready for installation. There will be cabinet type systems similar to the one illustrated at right, 15 GPM to 200 GPM with many new features of convenience such as the computing unit shown, as well as specially engineered systems for fueling at speeds of more than 200 GPM using the new Wayne High-Lift Pump.

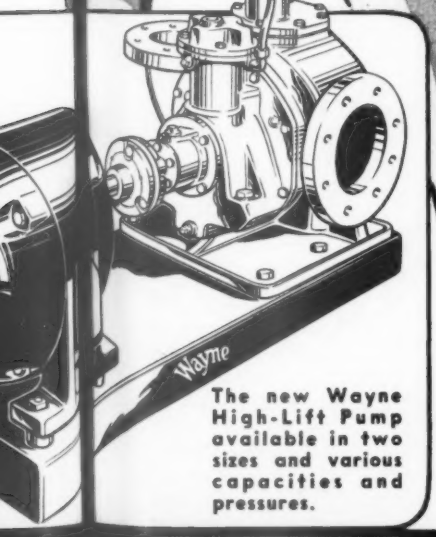
High speed at low pressure, the use of multiple outlets, nozzle control as easy at 150 GPM as on a service station pump at 15, are all possible now. The Wayne Collaps-a-Hose System also permits bottom refueling and the use of much larger hose.

The Wayne Water Detector Lock prevents the withdrawal of water from storage tanks and positively keeps it out of the suction stub in the system. Literature will be ready later but engineering information is available now. Write today if you have a refueling problem.

THE WAYNE PUMP CO., FORT WAYNE 4, INDIANA

Wayne Aircraft Refueling Syste

FOR THE AIRLANES OF TOMORROW



The new Wayne High-Lift Pump available in two sizes and various capacities and pressures.

COMPACT CABINET UNITS SIMILAR TO THIS WILL BE AVAILABLE IN CAPACITIES FOR EVERY REQUIREMENT

ystems. faster..with ease and *Safety*

Ralph Russell in Europe

NPN News Bureau

WASHINGTON—Ralph P. Russell, assistant director of PAW's supply and Transportation Division, is on temporary leave, attached for about three months to U. S. Strategic Bombing Survey of War Department in Europe. His mission, presumably, is to study the transportation situation on the continent.

WPB Brightens Outlook for Auto Reconversion, Perhaps to 2 Million a Year After V-E Day

By A. H. Allen
Special NPN Correspondent

DETROIT—Recognition by the War Production Board of the essential character of steps necessary to the speedy reconversion of industries completely converted to war production—such as the automotive industry—has brightened the prospect for a quick resumption of passenger car production after V-E Day, or even before if it appears there will be no formal date for victory in Europe. Following a recent meeting between J. A. Krug, WPB chief, top military representatives and production officials of the motor industry, the WPB has taken the following important steps:

1. Appointed Henry P. Nelson, former production executive of International Harvester Co., and director of the WPB Aircraft Division, as co-ordinator of automotive reconversion with headquarters in Detroit and several assistants working under him.

2. Approved placing of orders by the motor companies for $50,000,000 worth of "key" machine tools required before any production can be resumed. Priority rating of AA-3 was granted these orders, just below essential military orders. (Later it has been learned some machine-tool builders have less than three weeks' backlog of rated military orders. Hence they may be able to get early start on automotive tools.)

3. Approved AA-3 rating on $35,000,000 of plant construction work. This sum covers no new plants but rather modifications to present facilities, such as new heat treating furnaces, conveyor lines, small shop extensions, etc.

Tool and Die Work Begun

4. Approved $40,000,000 worth of equipment reconditioning, overhauling, maintenance, etc.

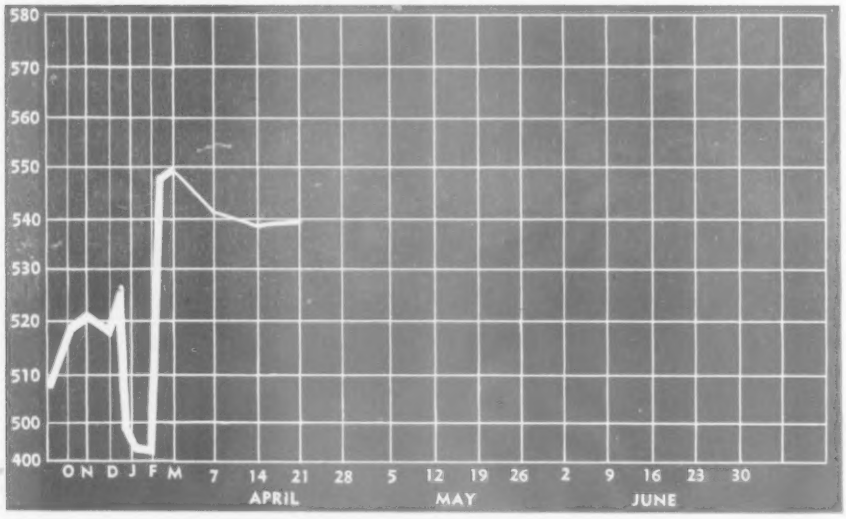
Already a fair volume of tool and die work has been started for eventual automotive production. Detroit area tool and die shops, greatly expanded both in number and size during the war, have had a considerable amount of open capacity in recent months and have been able to accept non-rated automotive work. Several of the larger shops are now reported busy on fender dies, which, incidentally, have about the longest "lead" time of any automotive tooling and are most costly, a single set of front fender dies, for example, currently running close to $100,000.

Meanwhile the first important cutbacks in war production around Detroit have been announced, being principally in plants building airplane parts on subcontract, and at the Ford Willow Run bomber plant, where production of B-24 Liberator bombers will be terminated by the end of July. Willow Run has built more than 8000 B-24s, and monthly production has been as high as 462 complete bombers. More than 20,000 are employed at Willow Run, 34% women, and among the latter extensive layoffs already have been made. By July another 8000 in other Ford plants supplying parts to Willow Run will be displaced, along with an estimated 100,000 in plants of suppliers and subcontractors throughout the country.

Approximately 8000 Buick employes in Chicago and Flint, Mich., will be laid off because of termination of manufacture of radial Pratt & Whitney engines installed in the Ford-built B-24s. Buick will continue production of engines for other transport craft.

Cutbacks in production of B-17 Flying Fortresses at Douglas and Lockheed plants in California has brought stop orders to several automotive subcontractors, including Briggs, Murray and others. The same situation has developed in connection with a 35 per cent cutback in P-

Tank Car Hauls to East Drop 776 b/d

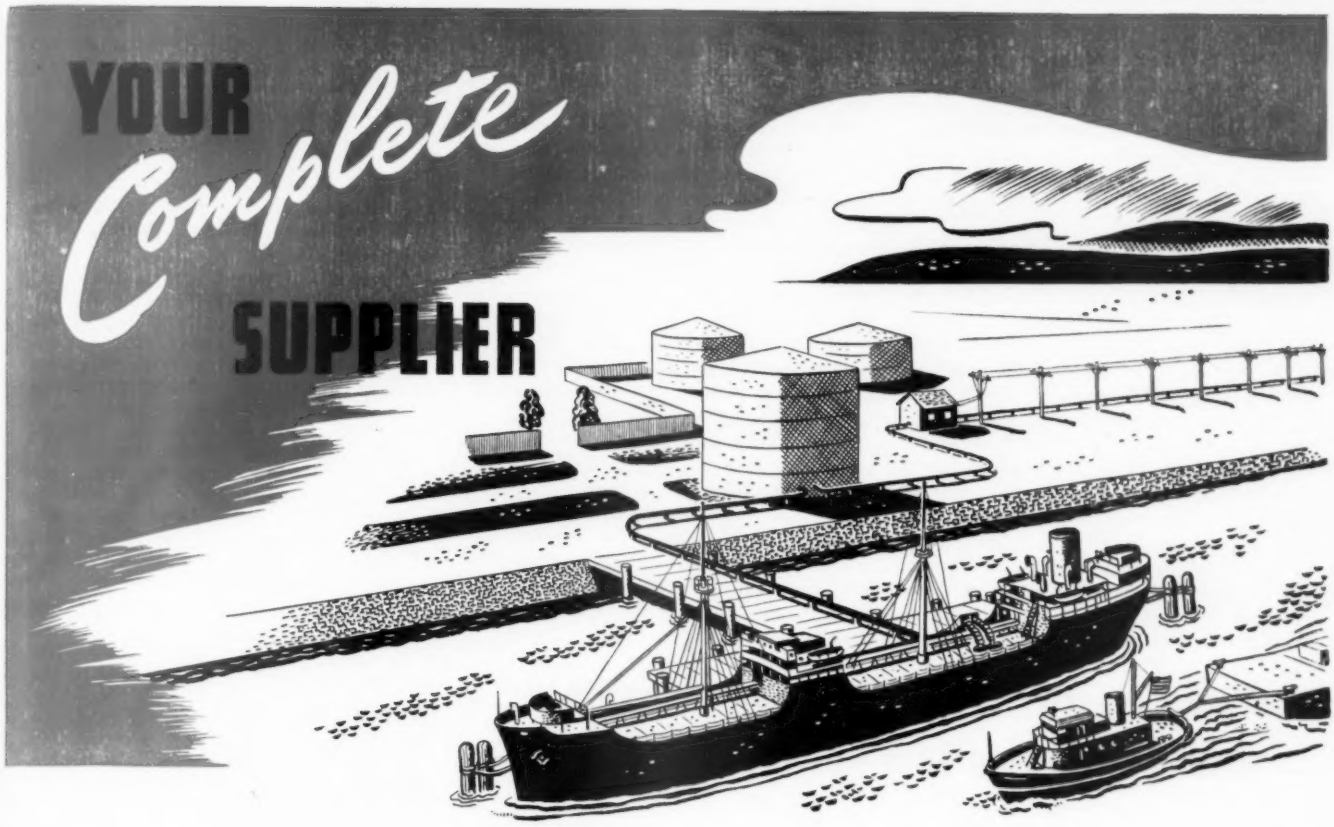


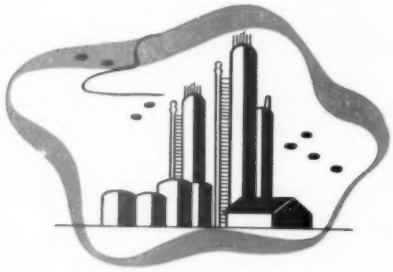
NPN News Bureau

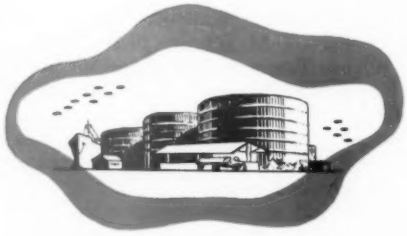
WASHINGTON—Tank car hauls of crude and products to the East Coast during the week ended April 21 averaged 538,667 b/d compared with 539,443 b/d during the previous week, or a drop of only 776 b/d, about one-tenth of one per cent. Number of cars loaded was 17,511 compared with 17,537 previous week. Shipments by companies follow:

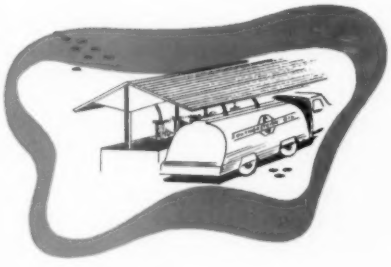
Allied Oil Co.	56	Elk Refining	19	Pure	284
Allied Oil Corp. (Ill.)	8	Franklin	3	Republic	89
Amsco	198	Freedom Oil	5	Richfield	170
Anderson-Prichard	2	Geier-Jackson	37	Roosevelt Oil	1
Arkansas Fuel	116	Globe	79	Root	54
Ashland Refining	235	Gulf	1970	Royal Petroleum	144
Asiatic Petroleum	13	Hartol	155	Shell	1031
Atlantic Refining	596	Hess, Inc.	3	Sinclair	325
Bell Oil & Gas	3	Home Oil	16	Skelly	36
James B. Berry Sons	5	Hunt	6	Socony-Vacuum	2168
Canfield	1	Independent	30	Southland	11
Cantelou	36	Jenny Mfg. Co.	133	Southport	18
Chalmette	13	Libby	2	S. O. California	18
Champlin	112	Maritime Oil	8	S. O. Indiana	748
Cities Service, (Pa.)	188	Mid-Continent	10	S. O. New Jersey	2723
Cities Service, (Ill.)	49	National Refining	1	S. O. Ohio	231
Continental	2	Ohio Oil	10	Sun	1844
Cooperative GLF	9	Pan American	1232	Talco	40
Cosden	50	Pana	7	Texaco	1416
Crown	36	Petroleum Heat & Power	35	Tide Water	106
Daugherty	29	Phillips	282	Tiona	4
Deep Rock	37	Premier	37	Triangle	13
Dornoil	2	Primrose	13	White Fuel	44
Drake	23				

YOUR *Complete* SUPPLIER









. . . TRANSPORTATION

Large modern tankers are to be added to our present transportation facilities which consist of a fleet of over twenty barges and ten towboats—so that the cheapest and most efficient means of transporting bulk petroleum will reflect in competitive supplies for independent marketers along the Atlantic seaboard from Tampa, Florida to Boston, Massachusetts. For those areas where pipelines provide the most economical and efficient transportation, Southeastern is now developing terminal take-off facilities.

Important also for competitive independent marketer operations are quality products, well located terminals and adequate distribution facilities—these too, Southeastern will provide so that you will look to us as your complete supplier.

SOUTHEASTERN OIL
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MEXICO CITY

38 Lightning fighter plane production.

Recent weeks have also brought cutbacks in production of Wright engines, scores of parts for which are made in various Detroit plants which have been compelled to make extensive layoffs, which incidentally have not been officially announced.

It is the announced intention of WPB to "get out of business" just as quickly after V-E Day as is physically possible, keeping in mind that production for the Pacific war must retain top priority on materials and manpower. Estimates indicate nearly a third of the WPB controls on materials and production (M and L orders) can be relaxed following victory in Europe.

As far as basic automotive materials are concerned, it is believed they will be in ample supply by fall for initial production at a rate of about 500,000 cars per quarter. Some doubts are expressed on the score of a few items, in particular textiles, paint and lead, but the possibility of temporary substitutions may get around early shortages.

At the moment, it does not appear all automotive plants will be able to make an equal start in resuming passenger car production, since motor executives emphasize that no matter what the problem eventually may be, production for war will come first. It is hoped the WPB's Production Readjustment Committee may be able to shift war production loads from automotive producers to others supplying the same items, so that too much inequality between automotive producers in respect to time of start can be avoided.

Henry Ford II was quoted recently as stating his company could be producing automobiles from 60 to 90 days from the date a start was authorized, provided no inordinate difficulties were encountered in obtaining materials. Ford is in a good position as far as steel is concerned, operating its own mills which can roll sheet, strip and bars.

Two New Pipeline Projects Announced by PAW; Continued Expansion Seen Until Japs Give Up

NPN News Bureau

WASHINGTON — PAW's pipeline program appears to be slated for continuance until the final defeat of Japan, for as one project is completed and put into operation, another pops up to take its place.

Two new projects which are now out of the drawing-board stage and ready to get under way are construction of 119 miles of crude line from the Mississippi oil fields to Baton Rouge, and construction of a 152-mile crude line from Rangely Pool in Colorado to Wamsutter, Wyo.

Complete text of PAW's latest pipeline progress report, including details on the two projects just described, follows:

Project No. 25: Construction by The Ohio Oil Co. (now owned by Buckeye) of 105-mile 8-in. products pipeline from Robinson, Ill., to Indianapolis.

Line has been completed and is now operating at a low rate. A temporary pumping unit has been installed at Robinson station pending receipt of permanent equipment. The Indianapolis truck terminal will not be entirely completed until latter part of May.

Project No. 29: Construction by Colonial Beacon Oil Co. of 37-mile 4 and 6-in. products pipeline from Everett to Dracut, Mass.

The 6-in. line from Everett to Waltham was placed in operation March 16. Three batches of products have been pumped through this line, one batch going on through the 4-in. line to West Boylston terminal at Worcester. The 4-in. line from Waltham to Dracut and truck terminal at the latter point remains to be completed. Work has been suspended awaiting results of the appeal of the city of Lawrence to the State Supreme Court in connection with a permit granted to cross the Merrimack River. This case may not be heard until the fall session of the court.

Project No. 33: Construction by Texas-New Mexico Pipeline Co. of 30 miles of 12-in. loops between Crane and Houston, Tex.

All pipelaying has been completed. The additional 200 hp. pumping unit at Rosanky station is 92% installed. All materials for station changes at five locations have been ordered and three pumps received. It is anticipated all materials will be on hand during April. Construction of supercharging equipment at three stations is 36% completed. All station work is expected to be finished during May.

Project No. 35: Construction by Sinclair Refining Co. of 60-mile 8-in. crude line from Big Sand Draw and Crook's Gap oil field to Lost Soldier, Wyo.

All pipe for the 23-mile 8-in. line from Crook's Gap to Lost Soldier has been welded but only five miles laid in trench. The remaining pipe has been laid on surface and will be placed in ditch at some future date. Tankage at Crook's Gap is completed. Station building at that point is 80% completed and equipment 90% installed. All pipe for the 36½-mile 8-in. line between Big Sand Draw and Crook's Gap has been received. About 26 miles of pipe have been strung and 18 miles welded. Tankage at Big Sand Draw is 40% erected and equipment at station 80% installed.

Project No. 36: Construction by Interstate Oil Pipeline Co. of 119 miles of 8, 10, and 12-in. crude lines from Mississippi oil fields to Baton Rouge, La.

Completed field survey shows length of lines aggregate 118.73 miles. About 85 miles of right-of-way have been purchased. Construction contract has been awarded to Sharman and Allen. Work cannot start until pipe is received from mill in next few weeks. Designs for Gibson Landing and Cranfield stations are 75% complete and for Liberty station 60 per cent complete.

Project No. 37: Construction by Utah Oil Refining Co. of 152-mile 10-in. crude line from Rangely Pool in Colorado to Wamsutter, Wyo. Also 25 miles of 8-in. loop between Uintah Junction and Salt Lake City refinery.

Revised project application only recently approved. Work not expected to start until May.

Project No. 38: Construction by The Texas-Empire Pipeline Co. of 164 miles of 12-in. loops between Sheldon, Mo., and Hayworth, Ill.

Shipments of pipe from mills are expected to start during the second week in June. Orders have been placed for valves, fittings, pipe coating, etc. Preliminary work in connection with obtaining highway and railway crossing permits is completed. Right-of-way agents will start work in the field shortly. Specifications for pipeline construction are being prepared and will be mailed to contractors with invitation to bid on work prior to May 1. The Diesel engine has been dismantled at Warrensburg, Ill., station and is being shipped to Oklahoma for installation at Alluwe station.

For the period April 14 through April 20 pumpings through the 24-in. line from Longview to Norris City averaged 319,114 b/d, with 8289 b/d delivered to the Ohio line. Pumpings through the 24-in. line from Norris City to the East Coast averaged 315,284 b/d, with 158,442 b/d delivered to refineries in the Philadelphia area and 166,883 b/d delivered to refineries in the New York area.

For the period April 14 through April 20, the 20-in. line pumped 231,313 b/d of products from Beaumont with 231,527 delivered to purchasers in the New York area.

For the period April 12 through April 18, the Southwest Emergency Line pumped 78,239 b/d from Heard Station.

Texas Governor Ready to Sign Bill Boosting Load Limits

Special to NPN

AUSTIN, Tex.—The new load limit will be a boon to Texas gasoline and oilfield equipment haulers. Passage came after Col. J. M. Johnson of the Office of Defense Transportation came out in support of the measure. Col. Johnson said the low limit had hampered the transportation of war materials for several years, especially in the case of trucks transporting high-octane gasoline.

The bill ran into considerable opposition in the House of Representatives. Rep. E. L. Covey made a determined fight against it, protesting that only 1.1% of the trucks in commercial use in the state were registered for the old maximum of 38,000 pounds and insisting that the higher limit was advocated by cement companies that would profit when roads destroyed by the heavier traffic were rebuilt.

Rep. John Bell, sponsor of the bill, pointed out that other states adjoining Texas already had higher load limits, some up to 80,000 pounds, and that passage of the law would permit lowering of truck freight rates.

The new law leaves unchanged the section of the old one which determines the weight a truck may carry on a formula based on wheel bases and load distribution.

"Won't Mrs. DelMedico be surprised?"

"What an improvement!" writes William L. (Red) Ryan, operator for the Hunnewell Trucking Co., Inc., of Boston, Mass. "Your Timken Easy-Power Shift is really in the groove. Because there is no loss of speed in shifting I can pass most other trucks on the grades. I am now making the fastest time I've ever made on this run . . . Man alive! That 2-Speed Axle with Easy-Power Shift sure makes a difference. Won't Mrs. DelMedico be surprised when I pull into Boston away ahead of time?"

SURPRISE: Mrs. M. S. DelMedico, Terminal Mgr. for Hunnewell, greets Driver Ryan at the end of his run. Mrs. DelMedico is one of the few women truck dispatchers in Massachusetts, and has ably demonstrated her ability. Of the Timken Easy-Power Shift, she writes, "The Easy-Power Shift effects a big saving in time, over trucks with conventional shift, and enables us to handle more goods every 24 hours."

RESULT: The savings in gasoline, time, and engine wear, made possible by the Timken 2-Speed Double Reduction Axle with Easy-Power Shift, have been a great contribution to the efficiency of the Hunnewell operation, and have a direct bearing on operation ratio, according to J. F. Robinson, president . . . The Hunnewell Trucking Company has been complimented by the Office of Defense Transportation for outstanding utilization of vehicles, handling of property and maintenance of equipment.

AXLES ARE IMPORTANT! For improved performance, lower maintenance costs, longer life — select a vehicle with Timken Axles . . . backed by 39 years' experience serving the leading manufacturers of all types of commercial vehicles.

The Accepted DTA Co. Standard

TIMKEN AXLES

THE TIMKEN-DETROIT AXLE COMPANY, DETROIT 32, MICH.
WISCONSIN AXLE DIVISION • OSHKOSH, WISCONSIN

Illinois Basin Drillers Active With 80 Tests in Prospect

Special to NPN

GRAYVILLE, Ill. — Chief interest in the development in the Illinois Basin is focused on the Boyd oil pool in Jefferson County, Ill., and in Edwards County; also scattered operations in southern Indiana. Wet weather has retarded drilling, but new producers have been added in a three-county Illinois area centered here. Pending operations total 80, with Edwards County having the largest number of tests.

The Superior Oil Co. added two new wells to production last week in Edwards County, both in Bridgeport, totaling 18 and 30 b/d.

With the Wabash River now back in its banks and no new rise in prospect, oil operators who have been shut down at places in the flood area for over a month and a half are getting started again.

Two wells are being put down in Spencer County, Ind., by Douthitt-McKinney and two by Superior Oil Co., in the Owensville pool, Gibson County, Ind. Ashland Oil & Refining, in conjunction with A. J. Hoffman, Evansville construction man, will renew the oil search in Vanderbrough County. It is historic dry-hole territory.

Several test operations are going down in small pay territory of Posey County, Ind.

Reports Elk Hills Output Is Near Maximum Congress Set

NPN News Bureau

LOS ANGELES — Oil production at Elk Hills has almost reached the maximum authorized by Congress, H. D. Collier, president of Standard of California, disclosed last week.

The development is more than two months ahead of schedule, Mr. Collier said, and the maximum of 65,000 b/d has been reached for a short period, but that the average now is back to approximately 63,000 b/d because of operating conditions and repressuring work.

Some additional drilling will continue in order to insure an even flow of crude without forcing individual wells beyond their most efficient production and to prevent any possible injury to the reservoir as a whole, Mr. Collier said.

Feud Over Price to Be Paid for Carbon Black Gas Cramping Program as OPA Denies Phillips' Plea

NPN News Bureau

WASHINGTON — OPA's inability to obtain facts that it can sink its teeth into regarding a "proper" price for natural gas used to manufacture carbon black, now the most critical tire component, seems likely to hamper the recently-announced huge carbon black expansion program.

OPA officials freely admit that they wonder how natural gas suppliers, before the war, could come out very far ahead with such low prices paid by carbon black manufacturers, but the fact remains that such prices were in effect, and that's that.

The question whether prices for gas used to make black should be increased or kept at their present level was highlighted this week by OPA's rejection of an application by Phillips Petroleum Co. for a price of 3.5 cents per thousand cu. ft. for natural gas it supplies to a certain carbon black manufacturer.

Phillips applied to OPA by letter April 3 for a tentative maximum price for residue gas produced at the company's plants in Gray County, Texas, from commingled sweet casinghead gas and sweet gas-well gas produced in the Texas Panhandle. Delivery point was to be at the intake of the Texas-Elf Carbon Co.'s Bowers Carbon Black Plant, and price requested was 3.5 cents per thousand cu. ft.

In a return "letter order" (L-5 under RMPR 436) dated April 21 OPA reviewed the points raised in the Phillips application, noting that it appeared that Phillips present maximum price to that plant was fixed under terms of letter agreement between the two parties dated June 1, 1938 and May 13, 1939.

Under these agreements, OPA added, the price payable for all gas sold was 30% of the value of carbon black produced from Phillips' gas at an assumed yield of 1.425 lbs. per thousand cu. ft. measured at 14.95 lbs. absolute at a market value of 3.425 cents per lb. for the black, thus netting Phillips about 1.2 cents per thousand cu. ft. for its gas. OPA added that it understood these letter agreements "were cancelled as of April 1, 1945."

OPA set forth the standard used by the company in determining a "fair and equitable" price, noting that since the period of Oct. 1-15, 1941, was found not representative of prices for natural gas, May, 1942 was established as "a proper period" for this purpose. OPA added:

"The price of residue gas for sale in the manufacture of carbon black was not abnormal, nor were there seasonal market conditions causing the low price. Price of gas for this use was established by normal trade practices in this industry for this type of use. It was not due to unusual circumstances that during May, 1942, the price of gas for the manufacture of carbon black was lower than the price for gas for other uses.

"You also advise that the Phillips Petroleum Co. purchases large volumes of gas under contracts which require that it account to the sellers for part of the 'proceeds from the sale' of the residue gas and that under its leases Phillips is required to account to its royalty owners for a portion of the 'market value' or 'proceeds from the sale' of gas produced by it.

"As a result of dissatisfaction on the part of the producers and royalty owners with the low income resulting in a substantial degree from sales of gas at low prices to the carbon black companies, it is pointed out that Phillips and other gasoline plant operators have been flooded with claims, lawsuits, and threatened litigation.

Can't Decide Market Values

"The Office of Price Administration, of course, has no authority under the Emergency Price Control Act to establish 'market values' of a product. The determination of what is the 'market value' of gas would be a matter for the state court of each individual state. We might point out that there has been no request by your company that you be permitted by this Office to pay more to royalty interests pursuant to court order. The contention has been that your realization should be increased as well as that of the royalty interests.

"The price you request of 3.5 cents per thousand cubic feet for dry gas to be sold to the Texas-Elf Carbon Co. for processing in that company's Bowers Carbon Plant in the eastern part of the Panhandle field of Texas is out of line with prices prevailing in this gen-

Texas Drilling on Uptrend, But Wildcats Are Fewer

Special to NPN

AUSTIN, Tex.—Drilling operations in Texas this year are slightly ahead of last year's, but there has been a drop in wildcatting.

Figures released by the Oil and Gas Division of the Texas Railroad Commission show that 1925 drilling applications had been approved up to April 24 this year compared with 1855 during the same period in 1944.

There have been only 42 wildcats drilled, however, compared with 53 for 1944.

Oil well completions so far this year total 1202, compared with 978 last year. Gas well completions total 196 compared with 71 for the same period in 1944.

The increase in gas well drilling is attributed to increased markets provided by out-of-state gas lines, as well as greater use of natural gas by war industries entering Texas.

eral producing area for sales to this class of purchaser. The price as determined by your agreement in effect May 1, 1942, is, however, in line with prevailing prices to this class of purchaser in the general producing area."

OPA concluded by saying that, "after due consideration of the foregoing," it ordered that Phillips' application for a price increase be denied and the maximum price continue to be determined by the terms of the contract in effect since May 1, 1942.

Questioning of other agency officials as to how the new carbon black expansion program is progressing brings a stony silence. Smashing of the apparent natural gas price bottleneck may have to be accomplished, it seems, by Congress. One group on Capitol Hill already has had its investigators digging into the situation, both in Washington and in the Southwest. This committee —the so-called Mead Committee in the Senate—is expected to launch hearings when its chairman, Sen. Mead of New York, recovers from a slight illness.

Such hearings, NPN understands, will be open to the public.

Dates Texas Field Hearings

Special to NPN

AUSTIN, Tex. — At the request of the companies involved, the Texas Railroad Commission has postponed until May 30 a hearing scheduled on April 26 on alleged oil and gas production waste in Long Lake Field in Anderson, Leon and Freestone Counties.

Also postponed indefinitely was another hearing set for April 26 on waste production in the Cayuga field in Anderson, Freestone and Henderson Counties.

Hearings were set May 8 on production rules and regulations for La Blanca and South Weslaco natural gas fields in Hidalgo County. May 3 was set for hearing on a request to increase allowable oil production from North Cowden Deep field, Ector County.

Texas U. to Ease Lease Terms

Special to NPN

AUSTIN, Tex.—Leaseholders on University of Texas lands would receive some relief from Army restrictions under terms of a bill approved by the House Public Lands Committee.

It was pointed out that leaseholders near the Army air field at Pyote were forced to abandon development when the Army ruled that their derricks constituted a hazard to air navigation.

The bill authorizes the Board for Lease of University Lands to investigate such cases and, when the facts justify, to suspend provisions of the leases under which certain developments must be made within specific periods.

READY FOR ACTION!

PT Boat—the very name symbolizes speed and daring! Here, where operations are timed to the second—where minutes mean most—MILVACO valves and fittings are saving precious time in feeding the fuel that sends Uncle Sam's mosquito fleet of Patrol-Torpedo boats into action.

MILVACO valves and fittings are designed and engineered to provide a higher speed discharge in refueling operations—to maintain a smooth, constant, full and faster flow.

And this same precision workmanship, accuracy and unfailing dependability, now serving so many military uses, are embodied in MILVACO'S regular line of commercial valves and fittings for the petroleum industry which are now being produced for your more urgent needs.

MILWAUKEE VALVE CO.
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PRODUCTION NEWS

Boren's Parity Plea Raps 'Blind OPA'

NPN News Bureau

WASHINGTON—Rep. Boren, of Oklahoma, let everyone know this week where he stands on the issue of higher ceiling prices throughout the U. S. for crude oil.

He followed up an earlier introduction of a crude price "parity" bill (identical with the so-called Disney bill which died in the last session of Congress), with a blast at OPA for "the outstanding injustice that has been perpetuated and maintained."

Rep. Boren admitted that his bill had been criticized by some members of the House who felt Congress should not attempt to fix specific prices of a commodity. On the other hand, he maintained, the bill is not designed to fix a specific price but to offer "a standard by which the fairness of crude oil prices may be measured."

OPA, the Oklahoman said, has not been guided by the intent of Congress in fixing crude prices "but has substituted for that intent a philosophy of its own whose origin I cannot attempt to explain, except to say that it grew, in part, out of the incompetence of the men who were given authority over the matter of oil prices."

In his blistering speech from the House floor April 27, Rep. Boren declared that national security demands that the U. S. renew its ability to produce oil and provide conditions which will enable industry "to operate, not abandon" present reserves. He added:

"It is a blind, ignorantly conceived policy that is being followed. There is not a barrel of crude oil produced today that is not being sold at less than the cost of replacement through discovery of new fields. And simple justice demands that the large army of oil producers who have served this nation so capably in the past be encouraged to continue their service, not driven from their lifetime occupation."

TEXT OF BOREN BILL

Rep. Boren's bill, which has been referred to the House Banking and Currency Committee, reads as follows:

"To fix the price of crude petroleum and its derivatives and fixing a parity formula.

"Be it enacted by the Senate and the House of Representatives that in the fixing of prices of crude petroleum and the products thereof and derivatives therefrom, as provided under the Price Control Act of 1942, as amended, consideration shall be given to the necessity for exploring for crude petroleum and the maintenance of a competitive position in the petroleum industry and to that end shall give consideration to the parity prices as indicated by the relationship between the index based on the national average price of crude petroleum and the index of all commodities as reported by the Department of Labor, Bureau of Labor Statistics, in its wholesale commodity price index based on the year 1926; provided, however, that such ceilings shall not be fixed or maintained at less than 80% of parity and not to exceed parity, per barrel above present respective price ceilings for crude petroleum."

Oil Rig Ready to Start Work Near Los Angeles City Hall

NPN News Bureau

LOS ANGELES—The Seaboard Oil Co. of Delaware has the green light to sink an oil well almost within the shadow of the Los Angeles city hall.

The well will be on property designated as Lots 7 and 8 in the Avila tract near Figueroa Street and College ave.

Edward Smith, production manager of the Seaboard company, said drilling would begin within 10 days. Most of the wells in the district are less than 1200 ft. deep, but Mr. Smith said he was willing to go much deeper if necessary.

O.K. $7,520,000 for Elk Hills Drilling

NPN News Bureau

WASHINGTON — The House Naval Affairs committee this week unanimously approved the Navy's request for permission to spend $7,520,000 to drill 64 exploratory wells at Elk Hills. Working with the Navy in the drilling program, California Standard will supplement that sum with $880,000 of its own, the committee was told.

Leading the line of witnesses, which included Floyd Bryant, of California Standard, and ten naval officials, was Capt. William G. Greenman, naval petroleum reserves director. Capt. Greenman told the committee that he did not believe any additional legislation was necessary to authorize the Navy expenditure at Elk Hills, despite the fact that Budget Director Harold D. Smith had advised that Congress would have to "re-appropriate" the amount needed from Navy funds. Committee Chairman Vinson said he agreed with Greenman and later informed Mr. Smith of the committee's decision.

Information Needed Now

After explaining that 40 wells would be drilled in the shallow oil zone and 24 in the Stevens zone "the minimum number of exploratory wells" needed to provide a working knowledge of Elk Hills zones, Capt. Greenman stressed the urgency of the project.

Information on the field is needed now, he said, because the Army and Navy Petroleum Board has requested joint chiefs of staff "to initiate steps through the Secretary of the Navy to continue through 1946 the production of 65,000 b/d of oil from Naval Petroleum Reserve No. 1."

In an earlier announcement, California Standard's President H. D. Collier had disclosed that Elk Hills was more than two and a half months ahead of schedule and was "close to the maximum authorized by Congress."

The maximum allowable output of 65,000 b/d was actually reached for a short period, Mr. Collier said, but the average is now back to about 63,000 b/d because of repressuring work and operating conditions.

Some additional drilling will continue in order to insure an even flow of crude without forcing individual wells beyond their most efficient production and without permitting injury to the reservoir as a whole. Drillers have completed 236 wells in the last 10 months.

Production of these added supplies to the Navy's fuel resources, Collier said, was made possible only by team work of Navy and company staffs and the efficient efforts of the 19 drilling strings which participated in the Elk Hills operation.

New Impost on Texas Gas Is Headed Off Again

Special to NPN

AUSTIN, Tex. — The Texas House of Representatives has again gone on record against any new tax on natural gas, at least until it is proved that the state needs additional revenue.

By a vote of 67 to 63, the House tabled a motion which would have transferred a one-cent-per-thousand gas tax bill by Rep. Pat Wiseman from the Revenue and Taxation Committee to the Committee on Counties.

Wiseman, who made the motion, apparently thought his bill would receive a better reception from the Committee on Counties than from the Tax Committee. The latter has refused to report the bill out on the floor for consideration. It had previously killed a similar bill by Rep. C. S. McLellan.

Rep. W. R. Chambers, chairman of the Tax Committee, reiterated that his committee would not report out any additional revenue bills until it was shown that the revenue would be needed. He said that on the basis of a subcommittee report it would be unnecessary to enact any new taxes. The committee, he said, has nothing to hide and has held full hearings on the gas tax measures.

Rep. McLellan said Texans were willing to pay more for gas in order that the state might realize more revenue from this resource. The house was not moved, however.

In the meantime, the Senate has adopted a resolution calling for sine die adjournment on May 10, leaving little time for gas and oil taxers to get their bills acted upon. Sentiment is also growing in the House for an early adjournment.

How many dollars is a good truck worth?...

When Lincoln was asked how long a man's legs should be, he answered, "Long enough to reach the ground."

The same homespun reasoning applies to the worth of a motor truck. The work you get out of it is what counts.

That is why Mack trucks are bargains—*on the job!* Mack trucks are *built* to work harder, to last longer and to operate at lower ton-mile cost.

For instance, when you use heat-treated alloy steel to the extent Mack does in every truck, you aren't aiming at price.

What you do aim at—and get!—is more work for longer time with less repairs and lower overall cost.

Mack's better construction has been making money for Mack owners since 1900. Now is the time to find out what it can do for you.

★ BUY THAT EXTRA WAR BOND TODAY ★

Mack Trucks, Inc., Empire State Building, New York 1, N. Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts.

Mack TRUCKS FOR EVERY PURPOSE ONE TON TO FORTY-FIVE TONS

Performance Counts!

(*Continued from p. 21*)
say that recapping is possibly here to stay on truck and large tires, but **Leo A. Howard** of that company expresses doubts if passenger tires will be recapped when new ones are available to all.

Several who simply gave the answer "No" to the question "Do you think recapping here to stay?" include **Perry Oil Co.**, Petoskey, Mich.; **I. B. Wood**, Solomon, Kans., (except truck tires); **Nelsen Ranken Oil Co.**, Camia Mills, Ill.; **O. & B. Oil Co.**, Elk Falls, Kans.; **North Branch Oil & Gas Co-op**, North Branch, Mich.; **Harmes Oil Co.**, Alleson, Ill.; **Jefferson Oil Co.**, Saginaw, Mich. (truck tires mostly); **Reid and Sons**, Hay Springs, Neb.; **Dutchess Auto and Supply Co.**, Millerton, N. Y.; **Harry E. Lynch**, Pueblo, Colo.; **Marley Williams**, Whitehead, Ind.

And now I'm glad to see that we have with us James D. Strickland, district director of OPA, of Indianapolis. Indiana is very fortunate indeed to have a practical man in this position, one who understands the multitude of problems that face the industry. The "gas" rationing program in Indiana has been outstanding, and oil men there give much credit for its success to Mr. Strickland. Could we have a few words from you, "Jim"?

Strickland Lauds Industry's Co-operation With Indiana OPA

MR. STRICKLAND — It is a source of satisfaction to me, as I know it must be to the petroleum industry in Indiana, to be able to look back on the pioneering done by the OPA and the trade in obtaining better compliance with rationing and price control regulations. The fact that our plan was adopted by OPA as a national program emphasizes the realistic attitude we took in the comparatively early stages of the program.

Just a little more than a year ago the gasoline rationing program admittedly was in a serious state of affairs. Counterfeit coupons were flooding Indiana as they were other states. Fortunately, however, we already had set up a trade advisory committee which had pledged itself to do everything possible to bring about co-operation of the trade in obtaining compliance. Thus we were prepared to meet the situation. A tightening of our own enforcement actions (and strong support from the trade leaders) pointing up the importance of keeping the program on a successful basis brought a great improvement within a few weeks.

The gasoline rationing program has been one of the most difficult at all times, but the advertising and public speaking campaign conducted by the trade last summer made it immeasurably easier. On the basis of past experience I feel confident that the trade will continue to exercise its vast influence in bringing about the co-operation of its members in assuring all consumers of a fair share of the available supplies.

MR. TAYLOR — Thank you, Mr. Strickland. Ladies and gentlemen, that is about all we have time for this session.

Our next and closing session will be "president's night", in which presidents of all the independent marketers associations will address you on various subjects they believe will be most helpful in this year of no conventions.

There will be no closing banquet. Some of the boys had one planned, but inadvertently pasted the meat and other ration stamps on a gasoline bingo sheet.

Be seeing you at the closing session of National Petroleum News Oil Marketers' Convention next week.

Equipment Personals

Promotion of **Clarion Studebaker** to be service manager of the Fruehauf Trailer Co., Boston branch, has been announced by **C. L. Sargent**, branch manager.

Mr. Studebaker has been affiliated with the Detroit factory branch for the past five years, and has worked through all the service departments.

• • •

The Chemical Fire Extinguisher Assn. at its recent annual meeting held in Chicago, re-elected the following officers:

Arthur G. Sullivan, vice president of the Buffalo Fire Appliance Corp., Buffalo, N. Y., president; J. O. Binford, general sales manager, American-La France-Foamite Corpo, Elmira, N. Y., vice president; Herman W. Diener, secretary of the George W. Diener Manufacturing Co., Chicago, treasurer; W. J. Parker of W. J. Parker, Inc., commissioner.

Directors re-elected are George H. Boucher, general sales manager, Pyrene Manufacturing Co., Newark, N. J.; and E. A. Warren, vice president, General Detroit Corp., Detroit.

• • •

Mr. Laud

Mr. Selig

Following a recent meeting of the Board of Directors, following the annual stockholders meeting in New York, General American Transportation Corp. announced the following change of officers:

Lester N. Selig, formerly president, was elected to the newly created position of vice-chairman, with **Max Epstein** continuing as chairman of the board.

Sam Laud, a director of the corporation and previously executive assistant to the president, was elected president.

W. S. Hefferan, Jr., a director of the corporation and previously secretary, was elected vice-president.

Arthur W. Lissauer, general manager of the corporation's process equipment division, was elected vice-president.

Maurice J. Feldman was elected secretary.

Frank E. Selz was appointed an assistant to the president.

Warns Texas Oil Tax Impost Is 73% as Large as Payroll

Special to NPN

DALLAS, Tex.—For every dollar it pays out in wages and salaries, the Texas petroleum industry's over-all tax bill is nearly 73 cents, according to H. J. Struth, economist for the Texas Mid-Continent Oil and Gas Association.

In an address before the Dallas Petroleum Accountants Society here, Mr. Struth said that taxes levied against the Texas petroleum industry's property and products last year amounted to $241,000,000. This included state, federal and local taxes on property, income and products. At the same time, Texans employed by this industry received in wages and salaries the sum of $332,000,000.

He said that 55% of the state's tax revenue from all business and property taxes came directly from the petroleum industry and that over one-third of all local taxes were paid by this one industry.

"The astounding fact about the Texas petroleum industry's huge tax bill," said Mr. Struth, "is the large number of separate taxes levied directly upon it by government. A list of all these taxes reveals that a total of 36 separate levies are charged against the production of Texas crude oil alone, all of which combine to make a total tax of 22-1/3 cents per barrel."

Mr. Struth asserted that governmental authorities were beginning to recognize the law of diminishing returns, which defeats the purpose of new tax measures by retarding the progress and development of industry. He concluded that the multiplicity of tax levies upon a single property in Texas was a handicap to oil producers of the state and urged that taxing authorities consider ways and means of reducing taxes to promote uninterrupted future development.

Law Firm Wins Oil Land Suit

LOS ANGELES — The law firm of Denio, Hart Taubman & Simpson, of Long Beach, Calif., last week was awarded a judgment of $19,000 from the city of Huntington Beach as a result of the firm's claim for a share of oil royalties from beach tidelands.

The supreme and appellate courts, in an earlier suit, affirmed the validity of a contract between the firm and the beach city, and the judge in the second case decided against the city of Huntington Beach in favor of the law firm.

The city has moved for a new trial.

These women aren't sissies, either!

No sissy business is the job of riding scientific herd on an oil rig that's drilling under a desert sun. That's the job of a petroleum engineer. Yet, one of our petroleum engineers is a woman.

No sissy business is the job of teaching tricks to those elephant-big mechanical gadgets in an oil refinery. That's the job of a mechanical engineer. Among our mechanical engineers is a woman.

Well, come to think of it, women never were sissies, anyhow. Look at the Revolution's Molly Pitcher. Look at the Civil War's Clara Barton. Look at World War I's Edith Cavell. Look at the thousands of women who, in this war, are doing men's jobs.

But look as you may, you'll find few doing more *important* work than the woman engineers, chemists, architects, and technical experts now holding down key posts in our organization. With their special know-how and training, they're helping keep the oil flowing to the armed forces — and to you.

This may not surprise you as much as it does us. That's because you get small chance to look beyond the service station and see how largely the oil business consists of overalls and effort. Oil gets under your nails. Sweat gets in your eyes.

Yet, at many pivotal points, that un-sissy process whereby a barrel of "crude" under the ground in California gets to the Philippines as 100-octane gasoline is kept going by women.

They're making careers in an industry almost as masculine as the Army. They're doing a "must" job. We thought you would like to know about them.

STANDARD OF CALIFORNIA

E flag with 4 stars,
awarded to our Richmond Refinery

Outlining Procedure for Setting Price Ceilings When Regulations Lack Definite Provisions

By Elwin E. Hadlick

In some seven previous articles there have been discussions of methods of determining price ceilings on various products and services sold in the petroleum industry. In attempting to determine the rules of any of the price regulations pertaining to the petroleum industry, every seller is bound at some time or other to come to a point where he has a product to sell under such circumstances that no sale price is set in the regulation and no definite formula for a price ceiling is provided.

Mr. Hadlick

In that kind of a situation the seller must look for that paragraph of the regulation which specifies the method of securing approval for maximum prices not otherwise provided for. Unfortunately the procedure is not the same in all price orders affecting the petroleum industry, either in the nature of information required or in the manner in which it is to be submitted. The purpose of this article is to start to point out the manner in which a seller can properly make application for establishment of a ceiling price on a product or service for which no ceiling price is accurately determinable under a particular regulation.

Rules Differ on LPG

There is probably no choice of regulations with which a discussion of this kind should be started. Accordingly, the first regulation to be looked at will be MPR 137, which pertains to sales and deliveries at service stations and other retail establishments of motor fuel, motor lubricating oil, greases, kerosine, prime white distillate, Nos. 1 and 2 fuel oil, range oil, cleaners and other naphthas, and sales of liquefied petroleum gas to consumers in single lot deliveries of 500 gal. or less. This regulation 137 is commonly called the service station price regulation; while that is not a correct nor complete description of what is contained in the regulation, the nickname will be used from here on in this article.

Provisions for seeking the establishment of a maximum price not otherwise determinable under the service station price regulation are contained in Sect. 11. In this single section of one regulation OPA has one set of rules for making an application for setting of a maximum price on liquefied petroleum gas and a different set of rules for applying for a price on other petroleum products covered by the regulation.

Considering first the manner of making an application for the establishment of a ceiling price for liquefied petroleum gas, for which a ceiling price is not otherwise determinable under the service station regulation, the following is found to be the rule:

The seller may make a sale, if he wishes, at a price which he sets, or he may first notify the Petroleum Branch, Office of Price Administration, Washington, D. C. in writing, that he has set a tentative price for which he seeks approval. In event of making a sale at the time of setting the price, the seller must notify the OPA of the setting of this tentative price within 15 days after making of the first sale; if the seller makes the proper report to OPA then the tentative price set by him is his proper and legal ceiling price until he hears from OPA either that such price has been approved, that OPA has set a substitute maximum price, or that the application has been disapproved for failure to submit the required information.

Further information on how to go about establishing ceiling prices on oil products when no ceiling price is set in the various OPA price regulations and a definite formula for a price ceiling is lacking is given in the accompanying article by Elwin E. Hadlick, prominent Minneapolis attorney and marketing association executive. The article is the 59th in his series on war-oil compliance regulations.

In submitting information to OPA in connection with the tentative price set on liquefied petroleum gas, under conditions above outlined, a seller is not required to use any particular form of application. His own letterhead is a sufficient form for the purpose so long as he provides OPA with the following data:

The tentative maximum price which he has set for the product, indicating type of seller, type of buyer, method of sale and other circumstances which show the kind of transaction which is involved, which explanatory matter should include a very exact description of the product and explanation of the reasons why the seller cannot establish his maximum price under other provisions of the price regulation; and finally, information as to the maximum prices for the same product of other sellers of the same class as the applicant at the same locality, or if there are no such maximum prices at such locality, the maximum prices of such other sellers and the applicant's own maximum prices at the three localities nearest the one at which the tentative price is set or the sale has been made.

It will be obvious to some sellers, when they come to make the kind of application herein referred to, that they cannot always furnish all of the information which the OPA regulations require. It is not sufficient to simply ignore the requirement. The applicant should explain why certain required data is not furnished.

Procedure on Others Differs

An application for setting of a ceiling price on other products covered by the service station price regulation is made in quite a different manner. A seller may not make a sale of these other products in advance of filing his application, i. e., there is no 15-day period of grace such as applies in the case of the setting of a tentative maximum price on liquefied petroleum gas.

Then again the seller must file his request for the setting of a tentative price not with the Washington Office of OPA, but with the District Office for the district in which is located the retail establishment from which the sale is to be made; not until such application is filed can the seller make a sale at such tentatively set price.

The seller may, with absolute safety, use his tentatively set price in making sales immediately after filing his application with the District Office and continue to do so until such time that the tentative price is corrected or disapproved by the Office of Price Administration, except in one circumstance, namely, that if OPA notifies the seller that action on his application is being held up pending the receipt of further information, the tentative price as set by the seller cannot from then on be used by him until approval by OPA.

The application should set forth reasons why the product cannot be priced under provisions of the regulation and it must explain the method by which the seller has calculated his proposed maximum price.

It must also give the reasons why the proposed maximum price is believed to be in line with the level of maximum prices otherwise established by the regulation, by showing what the maximum prices are for similar products having the same end use and serviceability which are currently sold by the seller, including a statement of the cost to the seller of each of such products; there must also be included information as to the maximum prices of the same product or of similar products having the same end use and serviceability sold by other sellers of the same class as the applicant in the same or surrounding areas.

Index of Week's War-Oil Orders

(April 21-28, 1945)

PAW—Petroleum Administration for War

Petroleum Directive 80—Manufacture of asphalt.

OPA—Office of Price Administration

RMPR 436, Am. 13—Specific ceilings for crude from Midway Field, Lafayette County, Ark. and Butler County, Ky.

Order 37, Am. 1—Crude subsidy list additions and deletions.

MPR 581, Am. 1—Deadline for filing statement with OPA extended.

RO 5C, Am. 185—Dealer may centralize ration evidences collected at several places of business.

RO 9A, Am. 19—Eligibility restrictions on oil cooking and heating stoves tightened.

WPB—War Production Board

L-180 as am. 4-20-45—Materials for production of replacement storage batteries.

Direction 1—Provisions incorporated in L-180 as am.

L-317, Interp. 5—Repaired or reconditioned containers.

L-345 as am. 4-24-45—Specific WPB authorization required for production of camelback for civilian use.

R-1, Direction 12—Restrictions eased on channel carbon black ratio.

CMP 1, Interp. 27—Making up deficiencies in Class B product production schedules.

Interp. 28—Cancellation of authorized controlled material orders when material is already in production.

CMP 9A as am. 4-17-45—Parts and materials for repairmen.

Pri. Reg. 25, Direction 1 as am. 4-20-45—WPB Orders covered by Pri. Reg. 25.

USCCA—U. S. Circuit Court of Appeals

Sixth Circuit Case No. 9834, Decision—Company bulk plant operators, as independent contractors, are excluded from Social Security Act.

Digest of Week's War-Oil Orders

Petroleum Administration for War

MANUFACTURE OF ASPHALT—Petroleum Directive 80—No asphalt or asphaltic products for paving purposes or dust palliatives may be manufactured other than the grades specified in Directive 80, effective 5-1. In those areas where delivery and use of road oil is prohibited or limited, flux oil may be manufactured only for use in connection with natural rock asphalt or with lump or powdered asphalt exclusively for plant-mix paving mixtures. Issued 4-27, effective 5-1.

Office of Price Administration

SPECIFIC CEILINGS FOR CRUDE FROM MIDWAY FIELD, LAFAYETTE COUNTY, ARKANSAS, AND BUTLER COUNTY, KENTUCKY—RMPR 436, Am. 13—Midway Field crude ceiling set at $1.18 per bbl. for 40 deg. API gravity and above, with a 2c-per-degree differential down to 86c for below 25 deg. Butler County, Ky. crude is assigned a flat ceiling of $1.37 per bbl. for all gravities. Issued 4-27, effective 5-2.

CRUDE SUBSIDY LIST ADDITIONS AND DELETIONS—RMPR 436, Order 37, Am. 1—19 pools in Ark., Ill., Kans., Ky., La., Mich., Okla., Tex., and Wyo. added to subsidy list, and one Ind. and four Okla. pools are removed. Issued 4-26, effective 4-1.

DEADLINE FOR FILING STATEMENT WITH OPA EXTENDED—MPR 581, Am. 1—In new price order covering industrial services the deadline for filing statement of prices with OPA is extended from 4-30 to 5-31-45. Issued and effective 4-21.

DEALER MAY CENTRALIZE RATION EVIDENCES COLLECTED AT SEVERAL PLACES OF BUSINESS—RO 5C, Am. 185—A person who operates as a registered dealer at more than one place of business may, upon written authorization of the District Director, retain at a central office all evidences collected at such places of business. The central office must keep the evidences collected at each place of business in a separate envelope or folder bearing name and address of place at which received, and no commingling is permitted. If the person is also registered as a distributor he may deposit in his ration bank account to the credit of each place of business only an amount of evidences equal to the gasoline delivered to that place of business. Daily records must be maintained by a dealer at each place of business, showing amount of gasoline received, evidences transmitted to central office, etc., and central office must likewise maintain separate records for each such place of business. Issued 4-28, effective 5-3.

ELIGIBILITY RESTRICTIONS ON OIL COOKING AND HEATING STOVES TIGHTENED—RO 9A, Am. 19—Replacement certificates will be issued to replace oil heating equipment in the emergency oil shortage area only to replace central-heating equipment installed in same premises, or to replace stove if applicant has used such a stove during at least the 6-month period preceding application date. Similar restrictions apply to oil cooking-stoves, and persons who can use a coal-wood stove are not eligible for oil cooking-stoves. Issued and effective 4-27.

RENEWAL OF RATIONS FOR HEAT, HOT WATER, OR HEAT AND HOT WATER FOR ENSUING HEATING YEAR—Rev. RO 11, Am. 56—See p. 12, April 18 NPN, for details. Issued 5-1, effective 5-5.

War Production Board

MATERIALS FOR PRODUCTION OF REPLACEMENT STORAGE BATTERIES—L-180 as am. 4-20-45—80-ampere hour batteries, for passenger automobiles and light trucks, may not be manufactured during any quarter, beginning with second quarter of 1945, in quantities greater than during corresponding 1944 quarter. The number of automotive replacement storage batteries which producers may manufacture during each quarter of 1945 will be determined by amount of lead available to them for this purpose under M-38. Production of civilian automotive replacement storage batteries must be apportioned so that all orders for batteries for medium and heavy trucks, truck-tractors, truck-trailers, passenger carriers and off-the-highway motor vehicles will be filled up to a quantity equal to the producer's 1944 average quarterly production of these types. Quality maintenance provisions are added. Used batteries must be turned in by consumers. Producers must dispose of metal-containing parts of condemned, traded-in, and used batteries within 30 days. Issued 4-20.

PROVISIONS OF DIRECTION 1 INCORPORATED IN L-180, AS AM.—L-180, Revocation Direction 1—Issued 4-20.

REPAIRED OR RECONDITIONED CONTAINERS—L-317, Interp. 5—Not subject to L-317's restrictions are solid or corrugated fiber containers reformed, reshaped, repaired or reconditioned without the addition of new container board. Issued 4-24.

SPECIFIC WPB AUTHORIZATION REQUIRED FOR PRODUCTION OF CAMELBACK FOR CIVILIAN USE—L-345 as am. 4-24-45—Quota provisions are removed and specific authorization required for all such production. Issued 4-24.

RESTRICTIONS EASED ON CHANNEL CARBON BLACK RATIO—R-1, Direction 12—Restriction on types of carbon black which may be used in any item removed, but total amount of all types permitted in manufacture of rubber or synthetic products is not increased. Issued 4-20.

MAKING UP DEFICIENCIES IN CLASS-B-PRODUCT PRODUCTION SCHEDULES—CMP Reg. 1, Interp. 27—Detailed and specific examples are outlined concerning application of paragraph (o) (2), providing that a deficiency on an authorized production schedule for a Class B product during any calendar quarter can be made up only in the following quarter, and only to extent that deficiency does not exceed 10% of authorized production schedule. Issued 4-21.

CANCELLATION OF AUTHORIZED CONTROLLED MATERIAL ORDERS WHEN MATERIAL IS ALREADY IN PRODUCTION—CMP Reg. 1, Interp. 28—If an allotment is reduced or cancelled and the consumer consequently cancels his authorized controlled material order, the producer may not ship, and consumer may not accept, controlled materials loaded for shipment or in production unless consumer has enough allotment left or another allotment available to place an authorized controlled material order. Consumer can receive material, even with insufficient allotment, if producer has shipped at time of receiving cancellation. Issued 4-25.

PARTS AND MATERIALS FOR REPAIRMEN—CMP Reg. 9A, as am. 4-17-45—Nothing new of interest to oil industry is added. Issued 4-17.

USE OF PREFERENCE RATINGS—Pri. Reg. 3 as am. 4-23-45—Added to List B, under item "gas cylinders" is the reservation "including only metal containers as described in Item 1 of Table 17 of M-293". Blanket MRO ratings may not be used to obtain List B items. Issued 4-23.

WPB ORDERS COVERED BY PRI. REG. 25—Pri. Reg. 25, Direction 1 as am. 4-20-45—L-180 (storage batteries) is deleted from list

CODE: AO—Administrative Order; CMP—Controlled Materials Plan; D—Directive; FDO—Food Distribution Order; GMPR—General Maximum Price Regulation; GO—General Order; Interp.—Interpretation; L—Limitation Order; M—Conservation Order; MPR—Maximum Price Regulation; P—Preference Rating Order; PAO—Petroleum Administrative Order; Pri. Reg.—Priorities Regulation; Proc. Reg.—Procedural Regulation; PS—Price Schedule; RO—Ration Order; RPS—Revised Price Schedule; SO—Supplementary Order; SR—Supplementary Regulation.

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Complete texts of all orders or amendments digested in war-oil orders can be had from Platt's Oil-LAW-Gram, 1213 West 3rd street, Cleveland 13, Ohio. Minimum charge single copies $1. Copies of these texts are always in stock but large orders can be promptly filled by reprinting as plates and stencils are also kept.

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Any 68 to 72 octane gas treated with Lubri-Gas gives premium motor performance.

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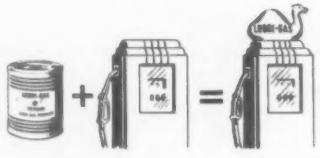
Lubri-Gas is essentially a 40SAE Lubricating Oil processed with a detergent and other gum and carbon inhibiting chemicals so that the treated oil mixes freely with the motor fuel, and lubricates the motor parts which otherwise would be without this needed protection.



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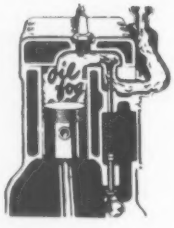

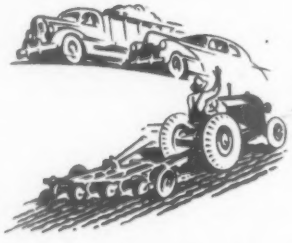

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of WPB orders coming under Pri. Reg. 25 (civilian production). Issued 4-20.

U. S. Circuit Court of Appeals

COMPANY BULK PLANT OPERATORS, AS INDEPENDENT CONTRACTORS, ARE EXCLUDED FROM SOCIAL SECURITY ACT —6th Circuit Case No. 9834, Decision—District Court (Western Dist. of Ky.) decision affirmed by Circuit Court of Appeals, in suit of Collector of Internal Revenue versus Standard Oil Company. Issued 3-12. (*See p.* 21).

Dist. 2 Committee Preparing Lancaster Plan Revision

NPN News Bureau

CHICAGO — The Dist. 2 D & M committee is fitting together a proposed amendment to the Lancaster Plan for issuing off the highway gasoline rations and is to submit it to Richard A. Youngblood, chief of OPA gasoline rationing. The commentary is to come principally from jobbers, oil company marketing departments and farm organizations in order to be practicable, B. L. Majewski, chairman of the D & M committee said.

Oil industry protests of the Lancaster Plan, which became effective on a nationwide basis on May 1, were very strong at the D & M committee meeting last week, and Mr. Majewski said that Mr. Youngblood had agreed to listen to suggestions for an amendment but made no specific agreement for their acceptance.

However, the plan was called unworkable in the Midwest where farming conditions are different than in Pennsylvania where it was tried out, and the oil men hope that something can be done about it. They do not believe it would reduce off the highway gasoline consumption by 20% or from 40,000 to 50,000 b/d nationwide as OPA anticipates.

Reports Tube Goods in Sight To Cover Drilling Needs

NPN News Bureau

TULSA—There need be no curtailment of drilling operations from lack of oil country tubular goods during the third quarter of this year, C. P. Parsons, director of materials for PAW, Washington, told members of the industry attending a meeting to discuss the materials situation here April 24.

Inventory position on usable pipe (casing and tubing) was placed at 445,000 tons as of March 1, he said, and added that, after conferring with military authorities, he had consented to ask the industry to take 50,000 tons out of inventory if the military would give up 30,000 tons of steel allocated to making rockets and bombs. Such an agreement was made.

Both Parsons and L. B. Holland, Dist. 2 director of materials, emphasized that for the first time a space directive had been put on the mills for the third quarter which would protect the industry from competitors for mill capacity.

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A WIGGINS BALLOON ROOF is often used as the central unit of a vapor-saving system at bulk marketing plants. When this is done the Balloon Roof is installed on one of the larger tanks at the station and the vapor spaces of other tanks are connected to it, forming a complete, efficient vapor-saving system.

The Wiggins Balloon Roof provides a variable vapor space in a tank which prevents vapor from being forced out of the tank and lost when fluctuating temperatures cause the air-vapor mixture to expand and contract.

The photo above shows a Wiggins Balloon Roof installed on a 25,000-bbl. tank and a 12,500-bbl. cone roof tank connected to it. At many locations this vapor-saving device is connected to several tanks.

Write our nearest office for complete details on Wiggins Balloon Roofs.

Would You Invest 111 Tons of Steel To Save 650 Tons of Aviation Gasoline?

An 80,000-bbl. tank with a Wiggins Balloon Roof connected to two 80,000-bbl. cone roof tanks may save as much as 210,000 gals. (650 tons) of aviation gasoline annually which otherwise might be lost through temperature variations.

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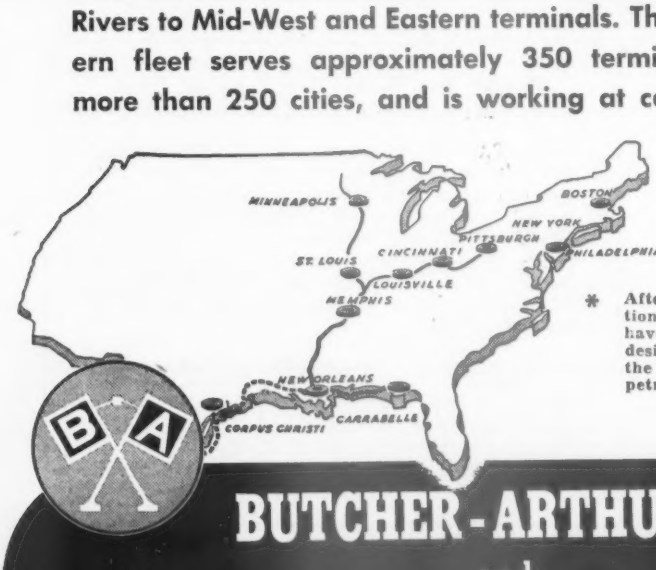
New Giant of the Waterways— The Oil Barge TOWBOAT

The flashing wheel of the old river boat has given way to the modern towboat pictured above, as the demand for speedy through delivery of crude oil and petroleum products has reached a new high during these war days. Our 20 towboats and 85 oil barges, owned and chartered, specializes in the waterway movement of petroleum products along the Texas-Louisiana Gulf Coast from Corpus Christi to Carrabelle, Florida, and up the Mississippi and Ohio Rivers to Mid-West and Eastern terminals. This modern fleet serves approximately 350 terminals in more than 250 cities, and is working at capacity.



* After the military situation permits, we plan to have additional specially designed equipment for the exclusive use of the petroleum shipper.

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Warren Platt in Italy

(*Continued from p. 7*)

been cleaned out but the kids got them in again. Four days were lost to clean these out. There also were "frequent leaks as a result of minor sabotage."

Again, heavy floods made it necessary to manhandle pipe into position, increasing the job 500%.

Again, the weather was so cold that the line froze several times during testing.

On another Volturno River crossing, it was discovered the first data from Italian records as to the maximum height of expected floods was off six feet so an alternate crossing was made.

Pipe laying standard performance, based on the first lines out of Naples, as figured by Maj. Webb from that construction, are set as follows:

Based on a 10-hour day for stringing and coupling crews, truck drivers, cooks and supply personnel, and using an average stringing crew of five men per truck with a coupling crew of eight to ten men over good terrain, or 12 to 15 over bad, and 10 men in one day to set a main-line pumping station:

Stringing pipe....60 man-hours per mile
Coupling pipe....75 man-hours per mile
Testing pipe.....10 man-hours per mile

Basis is ten-hour day per man. Where hard rain or strong wind are persistent add 50% to times set under A. and B.

	10,000 bbl.	5000 bbl.	1000 bbl.	500 bbl.
A. Prepare foundation	150	125	50	50
B. Erect tank	1280	1160	420	330
C. Tie into lines	50	50	50	50
D. Testing	150	100	75	50

Fantastic stories are sometimes heard about the number of line breaks and the amount of gasoline lost because these lines are laid on the surface. The record of the first line out of Naples shows surprisingly few breaks and the losses small.

The lines are laid on the top of the ground and generally in the ditches along the road, in order (a) to save stringing time and because trucks cannot go across fields in wet weather (b) because fields are often mined (c) to aid in inspection and repair.

There are objections, but the good points are considered as overweighing the bad ones for war purposes, where time is the great factor. Out of 17 breaks between Nov. 8, 1943 and Feb. 29, 1944 only five could be blamed on civilian tampering and that loss was a little over 500 bbls. Four breaks were made by careless handling of road graders. The rest were due to testing or some unexplained failure of the line.

Oil men working on this particular pipeline and tank building job were besides Capt. Grant, then a first lieutenant, 1st Lieut. L. A. Faegan of the Humble Oil pipeline department and last located at Odessa, Tex.; and 1st Lieut. A. B. Barrow, petroleum engineer and geologist formerly of Baton Rouge, La.

(And most of the time and for most of the miles these lines were being laid and the tanks constructed, the bombs were banging, banging, banging away—wham—wham —WHAM, and often right close by.)

With Yocom in the Pacific

(*Continued from p. 4*)

tory position of each particular area, backed up by formal monthly estimates. Forward estimates are made on a monthly basis, bulk requirements being calculated four months ahead of anticipated use and packaged requirements five months ahead. These estimates are then forwarded to ANPB at Washington for correlation with the requirements of other theaters, and very shortly PAW and then the Industry begin hearing about them.

It sounds rather easy and simple on paper, but both Capt. Lohman and Commander Shepherd assure you that it's not. Two factors make the job tremendously complicated: First, the great distances involved, and second, the fact that the oil logistics curve is so frequently subjected to violent peaks in demand, many of them entirely unpredictable.

The distance factor is amply illustrated by a few figures:

On the basis of an average 55-day tanker turnaround between the West Coast and the Marianas, of which Guam is the principal island, it would take the services of upwards of 100 merchant tankers to maintain a flow of 110,000 b/d of products into this area.

Defend Use of Old Tankers as Tank Farms in Forward Areas

Tankers, accordingly, are watched by APO even more closely than a mother hen watches her chicks. From what I can judge, nothing is being left undone that can be done to cut turnaround times to the minimum. Remarkable progress seems to have been made in this direction already. Take the case of Guam for example. This island was still in enemy hands last July and was not "secured" until sometime in August, yet the experienced oil men who are running the show here have now got to the point where they are turning black tankers around in three days and, with the improved installations that are going in, it's their expectation that this time can be cut by from 50 to 70% within the next few weeks.

Other areas further north cannot compare yet with the record here, being handicapped by lack of storage and unloading facilities but this definitely will not be the case for long.

On the subject of tankers, incidentally, Navy men out this way vigorously defend the use which has been made of many of the old ships up in the forward areas as floating tank farms.

"We feel that the fighting has been done with that floating storage," says Capt. Lohman. "It was quite a gamble, of course, and there were many schools of thought, but we did carry the war to the enemy and the result is apparent today."

Also defended—although their use for that purpose is regretted—is the occa-

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sional necessity of utilizing merchant tankers of the supply train for storage. That has happened several times so far up forward and undoubtedly will again, but there's a ready explanation. The recent Halsey strike at Indo-China is a case in point.

"All of a sudden," Capt. Lohman relates, "the Admiral saw that the screen door was open and he went in. Well, that was something that no one could have expected. As a result, he raised particular hell with our oil logistics, causing the oil pipeline flow to dam up in the merchant tankers and upsetting turnaround times all over the place. But quarrel with him for it—never. When they see the opportunity they've got to strike."

On the logistics side, its axiomatic that oil consumption increases as the cube of the speed. This explains why the logistics curve has huge peaks every time there is a major fleet operation, and why APO and all the many supply officers have to scramble to get storage filled in advance and then to replenish that storage as rapidly as possible.

What speed does to consumption is demonstrated by a fairly recent occurrence. The fleet was slowed down by 4 knots all at once and the result was a saving of a million bbls. of black oil.

Court Upholds Nine Majors In Madison Case Sequal

Special to NPN

ST. LOUIS — The Eighth Circuit Court of Appeals here has handed down decision favoring nine major oil company defendants in another jobber anti-trust case growing out of the Madison oil trial.

The suit was brought by Clark Oil Co. and Plymouth Clark Oil Co. of Manitowoc, Wisc., against Pure, Phillips, Sinclair, Standard of Indiana, Shell, Socony Vacuum, Skelly, Continental, and Cities Service.

Plaintiffs contended thed had paid higher prices for gasoline as a result of a conspiracy charged in the Madison case and the Appellate Court here upheld the decision of the lower court of Minnesota, which had said in effect that plaintiffs sought compensations and not damages. The Appellate Court concluded that "there being no basis for compensatory damages we are of the view that trial court was correct in entering summary judgment in favor of the defendants."

Sixteen other companion cases in Federal court of Minneapolis and St. Paul are said to be involved in the outcome of this case. E. A. Michel, Minneapolis attorney, represented the jobbers and David T. Searles of Houston represented the defendants.

OPA Cites Service Overcharges; Starts Suits in Chicago Area

NPN News Bureau

CHICAGO — OPA in an effort to curb alleged overcharges on automobile servicing and repairs has filed what OPA terms "the first in a series" of complaints in Federal district court here against one

service station and two garages for overcharging the price of greasing, washing and tire repairs ranging from 25c to 50c and overcharges on mechanical repairs ranging from 50c to 75c.

OPA is asking the court for undetermined treble damages and injunctions and also that the court compel the firms to file their March, 1942, base period prices.

"The defendants had been given license warning notices that they were not in compliance, but they were unheeded," OPA said.

Marion W. Isbell, OPA metropolitan director, said: "Due to the shortage of mechanics and because of increased demand for servicing as automobiles grow older, the trend toward overcharges in that field has become more pronounced."

California Penalizes Three Who Sold Fake Dyed 'Gas'

NPN News Bureau

LOS ANGELES—The State Division of Weights and Measures is cracking down on gasoline dealers who put red coloring in regular gasoline and sell it for Ethyl.

Two Los Angeles dealers have been fined $100 each for selling regular gasoline which had been dyed and a third drew a 30-day jail sentence.

Investigators said the practice of doctoring regular gasoline and then selling it for Ethyl was not widespread.

Los Angeles Chamber Opposes Super-Road Plan as Drafted

NPN News Bureau

LOS ANGELES — The Los Angeles Chamber of Commerce last week went on record against passage of a bill now before the state legislature which would give California a series of super-highways, asserting the bill does not show approximate cost of such construction, does not name routes, and fails to include other pertinent data.

The bill would impose a tax of 1½ cents on every gallon of gasoline sold in California to finance the road construction program.

The directors said that opposition to the bill did not mean that the chamber was opposed to construction of more highways or limited access freeways. They want "an immediate exhaustive, disinterested and expert study of future California highway improvements" so that a more comprehensive plan can be worked out.

Coming Meetings

MAY

NPN's Oil Marketers Convention-in-Print, proceedings of the 8th session, May 9.

OCTOBER

Indiana Independent Petroleum Assn., fall convention, Hotel Severin, Indianapolis, Oct. 10-11.

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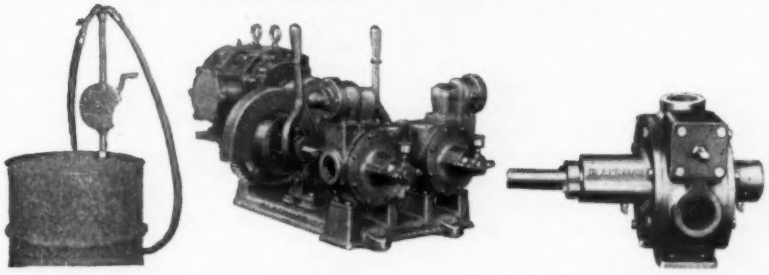
SELF-ADJUSTING FOR WEAR



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WOOD RIVER OIL AND REFINING COMPANY, INC.

Morrison Heads Illinois Assn.; Ask Easing of Regulations

Special to NPN

SPRINGFIELD, Ill.—Frank E. Morrison of Morrison Bros. Home Oil Co., Marion, Ill., was named president of Illinois Petroleum Marketers Assn. by the board of directors this week, according to Glenn A. Primm, executive secretary.

Mr. Morrison has been serving the association as vice president, and succeeds former President C. S. Rosenthal, who died in Miami Beach, Fla., recently. The Board of Directors meeting was in lieu of the association's annual spring convention, called off by the ODT ban.

Other action taken at the meeting of the board of directors includes the passing of five resolutions, which are in opposition to government regulation of the oil business and demand relaxations as rapidly as progress toward victory permits.

OPA's "Lancaster Plan" for handling off the highway gasoline rationing was protested in one resolution and modification asked to make it economically practical in this section of the country or otherwise to leave the present system alone.

Another OPA order the Illinois jobbers want relief from is the practice of debiting dealers for accepting valid gasoline coupons stolen from OPA offices and ration boards.

The presently unequal tax burden is extremely detrimental to private business, the oil men said, because of the Federal tax exemption of government corporations and co-operatives.

MIDWEST

(*Continued from p. 9*)

posed to have been complaints from a few refiners about not having space to store so many different grades. However, now PAW Washington, is hearing from the other side of the house, which declares PAO 80 is a repetition of 66, cancelled last fall.

Last year PAW also cancelled its restriction (Directive 72) against use of road oil for surfacing or maintaining roads, laying dust, etc., but OPA's Ration Order 11 has not yet been amended and still lists road oil as an unnecessary item, which prohibits its use. Trade information here is that OPA plans either to amend the regulation or instruct ration boards to issue fuel oil ration coupons to state highway departments, county officials and bonafide contractors who want to buy road oil as in a great many instances ordinary heavy fuel oil is used on roads.

° °

The Dist. 2 PAW office has received "locally needed" manpower survey reports on all of the 55 areas the manpower subcommittee started to work some two months ago. The surveys have all been approved by PAW and passed to WMC for final action.

National Petroleum News

Established February, 1909

Published every Wednesday by
The National Petroleum Publishing Co.

WARREN C. PLATT, *Editor and Publisher*

A. E. KRAFT, *Treasurer*

V. B. GUTHRIE, *Associate and Technical Editor*

Y. A. KOSKINEN, *Advertising Manager*

Member of
Audit Bureau of Circulation and Associated Business Papers, Inc.

Publication office: 1213 W. Third St., Cleveland 13, Ohio, U. S. A. Telephone, CHerry 7672. Cable Address PLATTOIL, Cleveland. Cable inquiries are answered by mail unless subscriber advances sufficient funds in American money to cover our cable cost.

NEWS BUREAUS

New York 20, 50 W. 50th Street, Telephone Columbus 5-1516 and 5-1517.

Washington 4, D. C., 1034-36-38 National Press Bldg., Telephone NAtional 3477.

Tulsa 3, Okla., 904 World Bldg., Telephone 3-7132.

Los Angeles 14, 610-A Hillstreet Bldg., Telephone VAndike 2845.

Chicago 5, 59 E. Van Buren Street, Telephone HARrison 5901-2-3.

Subscription rate $5 per year in United States, Mexico and Pan-American Countries; $6.50 in Canada and Foreign Countries. Current copies 20 cents, except special issues; back copies more than two months old 30 cents per copy.

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ADVERTISERS' INDEX

This index is published as a convenience to the reader. Every care is taken to make it accurate but National Petroleum News assumes no responsibility for errors or omissions.

Blackmer Pump Co. 47
Butcher-Arthur, Inc. 44

C-O-TWO Fire Equipment Co. 48
Chicago Bridge & Iron Co. 43
Cities Service Oil Co. 17

Fleet-Wing Corp. ..... Outside Back Cover

Hanlon-Buchanan, Inc. 25

International Harvester Co. 15

Kellogg Co., M. W. 22-23
Kellogg Division; American Brake Shoe Co. 45

Lubri-Gas Laboratories 42

Mack Mfg. Corp. 37
Mearl Corp. 19
Milwaukee Valve Co. 35
Morrison Bros. ..... Inside Front Cover

National Foam Systems, Inc. . . Inside Back Cover
National Petroleum News 46

Pittsburgh Equitable Meter Co. 27

Republic Oil Co. 1

Southeastern Oil 31
Standard Oil Co. of Calif. 39

Timken-Detroit Axle Co. 33

Wayne Pump Co. 28-29
Wood River Oil & Refining Co., Inc. 47

Market Reports

ATLANTIC COAST — No price changes. Suppliers report increasing military demands for Diesel oils. Demands for light fuels have eased considerably and one supplier said he was beginning to accumulate inventories for the first time in many months.

° ° °

CALIFORNIA — No price changes. Shortage of heating oils has eased somewhat due to continued warm weather. However, Diesel fuel still is scarce. Gasoline in California remained plentiful but in Tijuana, Lower California, it was reported extremely short.

° ° °

GULF COAST — No price changes were reported. Inquiries from eastern marketers for all grades of gasoline continue to "pour in," one refiner reported. He said he could meet consumer demands only partially since bulk of his material was going to military.

° ° °

MIDWEST — No price changes. The long distant effects of high water and floods that swept through the Southwest and are now subsiding were felt by refiners in this area. They reported transportation bringing products into the Midwest was tied up, and some refiners say they were without shipments for as long as three days. However, this situation eased off over the week-end.

Further north, in Michigan, Wisconsin and Minnesota a cold snap with snow flurries created a little run on burning oil supplies, which refiners said had been accumulated. One Michigan refiner reported that his storage of residuals was nearly full, but this is the exception to the general situation.

Most refiners and other suppliers are concerned about the future of burning oils as the Navy stepped up its demand from 35,000 b/d to 50,000 b/d for 702 special Diesel and Pool 21 gas oil beginning May 1, which dips heavily into distillate supplies. Military preference for the 702 Diesel will probably result in Dist. 2 suppying from 42,000 to 44,000 b/d of that product, supplemented with 6000 to 8000 b/d of Pool 21 gas oil to make up the 50,000 b/d order, reliable sources report.

An unusual quotation came from a marketer during the week, as he mentioned a price of 5.75c on housebrand gasoline, F.O.B. Shreveport, La., not including his authorized commission.

° ° °

MIDCONTINENT — Grade 26-70 natural gasoline sold at flat 4.125c f.o.b. Breckenridge April 23, with sale of one car reported. During rest of the week sellers quoted 4.125c and 4.375c, making a range for the product. Five cars were reported sold at 4.5c f.o.b. Group 3.

Flat price of 7c on 76 oct. Ethyl gasoline quoted by two refiners in Central West Texas (truck transports) was lowered to range of 6.875-7c April 23, when one refiner reported reducing his quotation to 6.875c.

Continued rain and cold weather in Midcontinent slowed demand for gasoline and tractor fuel and brought an increase in heating oils call. Floods have caused delays in tank car shipments and closed roads, hindering truck transportation.

° ° °

PENNSYLVANIA—No price changes were reported. Lower field refiner reports inquiry for 10 tank cars of 200 viscous neutral oil, 25 P. T. and willing to pay up to 31c for material. All products were tight although some refiners claimed that demands for light fuels had tapered off. A 5% increase in yields of pipeline crude next month is expected. This, refiners claim, will help them over some of the rough spots.

N.P.N. Gasoline Index

	Dealer T.W.	Tank Car
	Cents Per Gal.	
April 30	10.39	6.72
Month ago	10.37	6.73
Year ago	10.51	6.83

Dealer index is an average of "undivided" dealer prices, ex-tax, in 50 cities.

Tank car index is weighted average of following wholesale markets for regular-grade gasoline, FOB refineries or terminals: Okla., Mid-Western, W. Penna., Calif., N. Y. Harbor, Philadelphia, Jacksonville, Boston and Gulf Coast.

Daily Av. Pennsylvania Crude Runs

(Compiled by National Petroleum Assn. from reports of all companies refining Pennsylvania crude. Figures in bbls.)

Week Ended April 21, 1945	Week Ended April 14, 1945	Week Ended April 22, 1944
67,817	57,620	74,685

CRUDE PRICES

Since changes in crude oil prices are so few, the two pages of crude oil price tables hereafter will be printed only when there are sufficient changes in prices to warrant.

In the meantime a record is being kept in the Cleveland office of NPN and OILGRAM from which the publishers will be glad to make proofs, or letters or affidavits as to what the prices are, and without charge to regular subscribers. Changes in crude oil prices will be specially noted in this market section when made.

Crude Price Changes

No price changes reported for week ending April 25.

For latest table of crude prices published, see NPN April 25, pages 59, 60 and 57.

Summary of Daily Gasoline Prices (April 23 to April 30)

	Monday April 30	Friday April 27	Thursday April 26	Wednesday April 25	Tuesday April 24
U. S. Motor (ASTM octane)					
76 octane Ethyl:					
Oklahoma	6.75	6.75	6.75	6.75	6.75
Mid-Western (Group 3 basis)	6.75	6.75	6.75	6.75	6.75
N. Tex. (For shpt. to Tex & N. M. dest'ns.)	7	7	7	7	7
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	7 (2)	7 (2)	7 (2)	7 (2)	7 (2)
70-74 octane:					
Oklahoma	5.875	5.875	5.875	5.875	5.875
Mid-Western (Group 3 basis)	5.875	5.875	5.875	5.875	5.875
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.875	5.875	5.875	5.875	5.875
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.875	5.875	5.875	5.875	5.875
63-66 octane:					
Oklahoma	5.625 (1)	5.625 (1)	5.625 (1)	5.625 (1)	5.625 (1)
Mid-Western (Group 3 basis)	5.625 (2)	5.625 (2)	5.625 (2)	5.625 (2)	5.625 (2)
N. Tex (For shpt. to Tex. & N. M. dest'ns.)	5.625 (1)	5.625 (1)	5.625 (1)	5.625 (1)	5.625 (1)
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.625 (1)	5.625 (1)	5.625 (1)	5.625 (1)	5.625 (1)
60 octane & below:					
Oklahoma	5.25	5.25	5.25	5.25	5.25
Mid-Western (Group 3 basis)	5.2 - 5.25	5.2 - 5.25	5.2 - 5.25	5.2 - 5.25	5.2 - 5.25
N. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.2 - 5.25	5.2 - 5.25	5.2 - 5.25	5.2 - 5.25	5.2 - 5.25
W. Tex. (For shpt. to Tex. & N. M. dest'ns.)	5.25	5.25	5.25	5.25	5.25
Motor Gasoline, 70-74 oct.					
New York harbor	9.075	9.075	9.075	9.075	9.075
New York harbor, barges	8.5 - 8.975	8.5 - 8.975	8.5 - 8.975	8.5 - 8.975	8.5 - 8.975
Philadelphia district	9.075	9.075	9.075	9.075	9.075
Baltimore district	8.825	8.825	8.825	8.825	8.825
Motor Gasoline:					
Western Penna. Bradford-Warren:					
"Q" Gasoline, Min. 70 Oct. (ASTM)	7.625- 8.225	7.625- 8.225	7.625-8.225	7.625- 8.225	7.625- 8.225
Western Penna. Other Districts:					
"Q" Gasoline, Min. 70 Oct. (ASTM)	7.725	7.725	7.725	7.725	7.725

Note: To conform with Article IV of MPR 88 as amended August 15 we are substituting 70-74 oct. ASTM for the old 72-74 oct. ASTM. We continue to include in this group, Housebrand quotations.

REFINERY OPERATIONS

(American Petroleum Institute figures in thousands of barrels of 42 gal. each. Figures include reported totals plus estimate of unreported amounts and are therefore on a Bureau of Mines basis.)

Districts	Daily Average Crude Runs to Stills Week Ended		Gasoline Production at Refineries inc. Natural Blended Week Ended		Kerosine Production Week Ended		Gas Oil & Dist. Fuel Oil Production Week Ended		Residual Fuel Oil Production Week Ended		Total Stocks Kerosine Week Ended	
	Apr.21	Apr. 14	Apr. 21	Apr. 14	Apr. 21	Apr. 14	Apr. 21	Apr. 14	Apr. 21	Apr. 14	Apr. 21	Apr. 14
East Coast	730	761	1,962	1,963	168	182	990	933	1,530	1,677	2,572	2,353
Appalachian (Dist. 1)	105	100	307	291	61	59	71	80	91	105	239	242
Appalachian (Dist. 2)	57	59	175	186	3	14	46	32	101	113	35	63
Ind., Ill., Ky	741	792	2,845	2,780	218	213	701	663	983	1,034	1,288	1,385
Okla., Kans., Mo.	372	362	1,377	1,325	192	186	371	352	434	410	579	514
Inland Texas	248	253	1,008	981	95	100	119	119	478	477	172	161
Texas Gulf Coast	1,139	1,131	3,601	3,157	462	331	1,365	1,557	1,929	1,876	1,042	1,234
Louisiana Gulf Coast	193	212	536	660	160	244	241	404	179	266	1,107	916
No. La. & Arkansas	86	84	220	260	58	53	67	62	125	129	161	160
Rocky Mt. (Dist. 3)	12	12	38	35	4	4	7	7	24	23	20	20
Rocky Mt. (Dist. 4)	99	109	309	376	14	15	63	71	180	209	109	119
California	894	895	2,299	2,256	59	21	535	726	3,429	2,818	364	395
Total U. S.—B. of M. Basis	4,676	4,770	14,677	14,270	1,494	1,422	4,576	5,006	9,303	9,137	7,688	7,562
U. S.—B. of M. Basis, April 22, 1944	4,443		13,636		1,519		4,560		8,122		6,802	

Districts	Total Stocks Gas Oil and Distillates Week Ended		Total Stocks Residual Fuel Oil Week Ended		Gasoline Stocks *Military and Other** Week Ended		Gasoline Stocks Civilian Grade Week Ended	
	Apr. 21	Apr. 14	Apr. 21	Apr. 14	Apr. 21	Apr. 14	Apr. 21	Apr. 14
East Coast	5,650	5,285	6,038	6,007	6,766	7,023	7,490	7,165
Appalachian (Dist. 1)	375	395	188	187	1,114	1,148	1,187	1,199
Appalachian (Dist. 2)	113	111	160	160	580	591	863	1,011
Ind., Ill., Ky.	3,621	3,571	1,834	1,843	6,504	6,635	16,684	16,917
Okla., Kans., Mo.	1,779	1,717	1,157	1,186	1,775	1,769	7,508	7,615
Inland Texas	311	346	756	756	1,237	1,238	1,686	1,737
Texas Gulf Coast	6,128	6,010	5,648	5,654	10,023	10,738	5,553	5,558
Louisiana Gulf Coast	1,609	1,593	1,489	1,488	2,498	2,545	2,320	2,632
N. La. & Arkansas	720	702	236	254	943	927	1,940	2,049
Rocky Mt. (Dist. 3)	11	15	37	35	20	20	54	50
Rocky Mt. (Dist. 4)	315	330	612	635	459	468	2,061	2,070
California	7,587	7,838	22,337	23,333	11,568	11,823	4,271	4,482
Total U. S.—B. of M. Basis	28,219	27,886	40,492	41,538	43,487	44,925	51,617	52,485
U. S.—B. of M. Basis April 22, 1944	30,156		51,599		36,808		51,334	

*Includes aviation and military grades, finished and unfinished, title to which still remains in the name of the producing company; solvents, naphthas, blending stocks currently indeterminate as to ultimate use, and 11,795,000 unfinished gasoline this week compared with 11,949,000 bbls. a year ago.

**These figures do not include any gasoline on which title has already passed, or which the military forces may actually have in custody in their own or leased storage.

Percent Daily Refining Capacity Reporting—East Coast, 99.5; Appalachian (Dist. 1) 76.8, (Dist. 2) 81.2; Ind., Ill., Ky., 87.2; Okla., Kans., Mo., 78.3; Inland Texas, 59.8; Texas Gulf Coast, 89.3; Louisiana Gulf Coast, 96.8; No. Louisiana & Arkansas, 55.9; Rocky Mt. (Dist. 3) 17.1, (Dist. 4) 72.1; California, 85.5; Total U. S.—B. of M. Basis April 21, 1945 85.5; Total—B. of M. Basis April 14, 1945 85.5.

U. S. Crude Oil Production

(American Petroleum Institute figures)

	WEEK ENDED Barrels (Daily Average) April 21 1945	Barrels (Daily Average) April 14 1945
Oklahoma	°347,350	378,300
Kansas	°273,150	268,150
Nebraska	° 900	950
Texas	2,170,550	2,170,550
Louisiana	366,050	366,050
Arkansas	79,900	80,550
Mississippi	52,400	52,200
Alabama	300	300
Florida	15	15
Illinois	206,850	187,250
Indiana	11,400	11,700
Eastern (Ill., Ind. & Ky. excluded)	64,150	65,650
Kentucky	25,750	22,950
Michigan	43,300	53,400
Wyoming	106,050	106,350
Montana	19,800	19,750
Colorado	9,050	9,550
New Mexico	104,750	104,800
California	916,200	912,600
Total, U. S.	4,797,915	4,811,065

°Okla., Kans., Neb. figures are for week ended 7:00 a.m. April 19, 1945.

Crude Oil Stocks

(Bureau of Mines Figures in thousands of bbls.)

Grade or Origin	April 14	April 21	Change from April 14
Penna. Grade	2,175	2,139	— 36
Other Appalachian	1,295	1,232	— 63
Lima-Michigan	992	968	— 24
Illinois-Indiana	14,004	14,210	+ 206
Arkansas	2,634	2,506	— 128
Kansas	9,251	9,282	+ 31
Louisiana:	13,288	13,778	+ 490
Northern	3,401	3,577	+ 176
Gulf Coast	9,887	10,201	+ 314
Mississippi	1,098	1,205	+ 107
New Mexico	6,656	6,513	— 143
Oklahoma	30,103	30,152	+ 49
Texas:	111,062	112,058	+ 996
East Texas	18,417	19,123	+ 706
West Texas	32,177	32,356	+ 179
Gulf Texas	31,875	32,055	+ 180
Other Texas	28,593	28,524	— 69
Panhandle	5,257	5,621	+ 364
North	7,504	7,411	— 93
South	7,034	7,152	+ 118
Other	8,798	8,340	— 458
Rocky Mountain	6,367	6,363	— 4
California	19,850	19,953	+ 103
Foreign	2,249	2,570	+ 321
Total gasoline-bearing in U. S.	221,024	222,929	+ 1,905
Heavy in California	5,695	5,784	+ 89

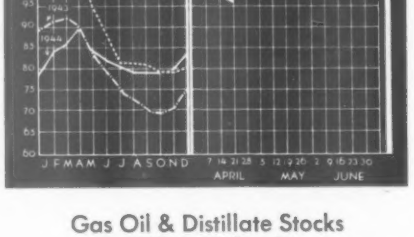
Crude Production & Runs to Stills

(Millions of Barrels)

Crude Output
Runs to Stills
1945
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D 7 14 21 28 5 12 19 26 2 9 16 23 30
1942
1943
1944
APRIL
MAY
JUNE

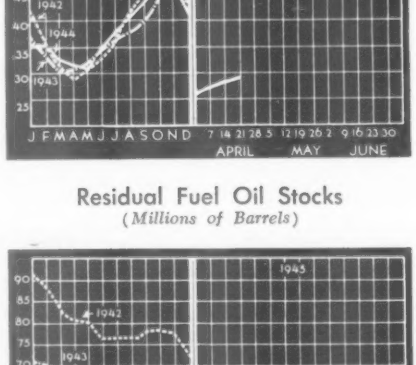
Gasoline Stocks

(Millions of Barrels)



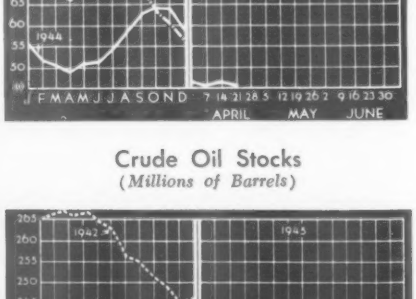
Gas Oil & Distillate Stocks

(Millions of Barrels)



Residual Fuel Oil Stocks

(Millions of Barrels)



Crude Oil Stocks

(Millions of Barrels)

OIL PRICE SECTION

★

At Refineries and Terminals and by Tank Wagon

Prices herewith are reproduced from Platt's *OILGRAM* Daily Oil Price Service, associated with National Petroleum News, whose representatives in all *NPN-OILGRAM* offices devote their time exclusively to reporting oil industry prices everywhere.

Prices shown are actual sales prices, or quotations meaning sellers' general offers or posted prices; for current sales and shipment; for the business day or period stated; except Tank Wagon prices, prices are for bulk lots such as tank car and motor transport; barge or tanker cargo lot prices are identified; FOB refineries or terminals; in cents per gal. except where shown in bbls. of 42 gals.; ex all fees and taxes; for crude oil and its products lawfully produced and transported; reported as received by *OILGRAM* and National Petroleum News but not guaranteed; for subscribers' private use only and not for resale or distribution or publication. For further details of price conditions apply to any *NPN-OILGRAM* office or see back of any *OILGRAM* Price Service invoice.

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Refinery Prices

Gasoline —U. S. Motor (A S T M) except where otherwise specified.

Prices in Effect	April 30	April 23
OKLAHOMA		
76 oct. Ethyl	6.75	6.75
70-74 oct.	5.875	5.875
63-66 oct.	5.625 (1)	5.625 (1)
60 oct. & below	5.25	5.25
MID-WESTERN (Group 3 basis)		
76 oct. Ethyl	6.75	6.75
70-74 oct.	5.875	5.875
63-66 oct.	5.625 (2)	5.625 (2)
60 oct. & below	5.2 – 5.25	5.2 – 5.25
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
76 oct. Ethyl	7	7
70-74 oct.	5.875	5.875
63-66 oct.	5.625 (1)	5.625 (1)
60 oct. & below	5.2 – 5.25	5.2 – 5.25
W. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
76 oct. Ethyl	7 (2)	7 (2)
70-74 oct.	5.875	5.875
63-66 oct.	5.625 (1)	5.625 (1)
60 oct. & below	5.25	5.25
CENT. W. TEX. (Prices to truck transports)		
76 oct.	6.875–7 (2)	6.875–7 (2)
70-74 oct.	5.875 (2)	5.875 (2)
67-69 oct.	....	....
62 oct. & below	5.25 (2)	5.25 (2)
KANSAS (For Kansas destinations only)		
76 oct. Ethyl	7.2 – 7.3	7.2 – 7.3
70-74 oct.	6.2	6.2
63-66 oct.	5.9 (2)	5.9 (2)
60 oct. & below	5.5	5.5
ARK. (For shipment to Ark. & La.)		
76 oct. Ethyl	7 (1)	7 (1)
70-74 oct.	5.875 (1)	5.875 (1)
62 oct. "	....	....
60 oct. & below, unleaded	5.25 (1)	5.25 (1)
WESTERN PENNA. (Motor gasoline)		
Bradford-Warren:		
"Q" Gasoline Min. 70 Oct. (ASTM)	7.625-8.225(a)	7.625-8.225(a)
Other districts: "Q" Gasoline, Min. 70 Oct. (ASTM)	7.725	7.725

a) Highs and lows for Schedule D area, in MPR 88 and outside Schedule D area, respectively.

Prices in Effect	April 30	April 23
CENTRAL MICHIGAN (FOB Central Mich. refinery group basis for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
U.S. Motor: (Oct. ASTM):		
70-74 oct.	7.875– 8.375	7.875– 8.375
75-76 oct.	9 (1)	9 (1)
Str. run gasoline, excluding Detroit shpt.	6	6
OHIO (S. O. Ohio quotations for statewide delivery and subject to exceptions for local price disturbances).		
70-74 oct.	8.25	8.25
CALIFORNIA U.S. Motor:		
76 oct. (Ethyl)	8 – 8.75	8 – 8.75
70-74 oct.	7 – 7.5	7 – 7.5
65 oct. & below (3rd grade)	5.75 – 6.25	5.75 – 6.25

Kerosine, & Gas Fuel Oils

OKLAHOMA		
41-43 grav. w.w.	4.375	4.375
42-44 grav. w.w.	4.5	4.5
Range oil	4	4
No. 1 p.w.	3.875	3.875
No. 1 straw	....	....
No. 2 straw	3.625	3.625
No. 3 fuel	3.5	3.5
No. 6 fuel	$0.90–$0.97	$0.90–$0.97
U. G. I. Gas Oil	....	....
14-16 fuel	$0.97 (1)	$0.97 (1)
MID-WESTERN (Group 3 basis)		
41-43 grav. w.w.	4.375	4.375
42-44 grav. w.w.	4.5	4.5
Range Oil	4 –4.1 (2)	4 –4.1 (2)
No. 1 p.w.	3.875	3.875
No. 2 straw	3.625	3.625
No. 3	....	....
No. 5	....	....
No. 6	$0.97 (1)	$0.97 (1)
N. TEX. (For shpt. to Tex. & N. M. dest'ns.)		
41-43 grav. w.w.	4.375	4.375
42-44 grav. w.w.	4.5 (1)	4.5 (1)
No. 1 p.w.	3.875 (1)	3.875 (1)
No. 6 fuel	$0.97 (1)	$0.97 (1)
W. TEX.		
No. 6 fuel	$0.97 (1)	$0.97 (1)
AMARILLO, TEX. (For shpt. to W. Okla. & Tex. differential territory.)		
42-44 grav. w.w.	4.5 (1)	4.5 (1)
KANSAS (For Kansas destinations only).		
41-43 grav. w.w.	No Price	No Price
42-44 grav. w.w.	4.7	4.7
No. 1 p.w.	4.1	4.1
No. 6 fuel	$0.95–$1.02	$0.95–$1.02
ARK. (For shipment to Ark. and La.)		
41-43 grav. w.w.	....	....
42-44 w.w. kero	4.5 (1)	4.5 (1)
No. 1	....	....
No. 2	3.625 (1)	3.625 (1)
No. 3 fuel	3.5 (1)	3.5 (1)
Tractor fuel, for shpt. to Ark. points only	5.125 (1)	5.125 (1)
Diesel fuel 52 & below	4 (1)	4 (1)
Diesel fuel 58 & above	4.25 (1)	4.25 (1)
WESTERN PENNA. *Bradford-Warren*:		
45 grav. w.w.	6.5 – 7.55	6.5 – 7.55
46 grav. w.w.	....	....
No. 1 fuel	6.75(1&b)	6.75(1&b)
No. 2 "	6.125-7.125(2&b)	6.125-7.125(2&b)
No. 3 "	6.25-7.25(1&b)	6.25-7.25(1&b)
36-40 gravity	6.625-6.75(2)	6.625-6.75(2)

(b) Highs and lows for Schedule D area, in MPR 88 and outside Schedule D area, respectively.

Other districts:		
45 grav. w.w.	7 – 7.425	7 – 7.425
46 grav. w.w.	7.125– 7.375	7.125– 7.375
47 grav. w.w.	7.375– 7.50	7.375– 7.50
No. 1 fuel	6.875– 7.175	6.875– 7.175
No. 2 "	6.75 – 6.875	6.75 – 6.875
No. 3 "	6.75	6.75
36-40 grav. Pittsburgh dist. prices excluded	6.625– 6.875	6.625– 6.875
CENTRAL MICHIGAN (FOB Central Mich. refinery group basis for shpt. within Mich.; shpts. may originate at plants outside Central group.)		
47-49 gravity w.w.	5.8 – 6	5.8 – 6
P.W. Distillate	5.5	5.5
No. 3 gas, oil, Straw	5	5
U.G.I. gas oil	4.5 (2)	4.5 (2)
Fuel Oils (*Vis. at* 100).		
300-500 Vis.	4.14 (2)	4.14 (2)
100-300 Vis.	4.5	4.5
OHIO (S. O. quotations for statewide delivery)		
Kerosine	7	7

Prices in Effect	April 30	April 23
CALIFORNIA		
40-43 grav. w.w.	5 – 7	5 – 7
San Joaquin Valley:		
Heavy fuel	$1.10 (2)	$1.10 (2)
Light fuel	$1.20 (2)	$1.20 (2)
Diesel fuel	4 (2)	4 (2)
Stove dist.	5 (2)	5 (2)
Los Angeles:		
Heavy fuel	$1.10 (2)	$1.10 (2)
Light fuel	$1.20 (2)	$1.20 (2)
Diesel fuel	4 (2)	4 (2)
Stove dist.	5 (1)	5 (1)
San Francisco:		
Heavy fuel	$1.15 (1)	$1.15 (1)
Light fuel	$1.25 (1)	$1.25 (1)
Diesel fuel	4.5 (1)	4.5 (1)
Stove dist.	5.5 (1)	5.5 (1)

NOTE: All above heavy fuels meet Pacific specification 400; light fuel, spec. 300; Diesel fuels, spec. 200; and stove distillate, spec. 100.

Lubricating Oils

Prices in Effect	April 30	April 23
WESTERN PENNA.		
Prices are for sales made, or offers reliably reported, to jobbers & compounders only.		
Viscous Neutrals—*No. 3 col. Vis. at* 70°*F.*		
200 Vis. (180 at 100°) 420-425 fl.		
0 p.t.	38 (1)	38 (1)
10 p.t.	37 (1)	37 (1)
15 p.t.	36 (1)	36 (1)
25 p.t.	28–33	28–33
150 Vis. (143 at 100°) 400-405 fl.		
0 p.t.	36 (1)	36 (1)
10 p.t.	35 (1)	35 (1)
15 p.t.	34 (1)	34 (1)
25 p.t.	26–31	26–31

NOTE: Limited quantity neutrals available to regular trade.

Cylinder Stocks:		
Brt. stk., 145-155 *vis. at* 210°, 540-550 fl., *No. 3 col.*		
10 p.t.	30.5 (1)	30.5 (1)
15 p.t.	29.5 (1)	29.5 (1)
25 p.t.	25	25
600 S.R. filterable	15	15
650 S.R.	15.5	15.5
600 fl.	16	16
630 fl.	17	17
MID-CONTINENT (F. o. b. Tulsa)		
Neutral Oils (*Vis. at* 100° *F. 0 to* 10 *P.P.*)		
Pale Oils:		
Vis. Color		
60-85—No. 2	7.5	7.5
86-110—No. 2	7.5 – 8.5	7.5 – 8.5
150—No. 3	11 –11.5	11 –11.5
180—No. 3	11.5 –15	11.5 –15
200—No. 3	12 –15	12 –15
250—No. 3	14 –16.5	14 –16.5
280—No. 3	15 –17	15 –17
300—No. 3	16 –18	16 –18
Red Oils:		
180—No. 5	11.5 (1)	11.5 (1)
200—No. 5	12 (1)	12 (1)
280—No. 5	No Price	No Price
300—No. 5	16–17.5 (2)	16–17.5 (2)
Bright Stock—*Vis. at* 210°		
200 Vis. D	27 (1)	27 (1)
150-160 Vis. D: 0 to 10 p.p.	23	23
10 to 25 p.p.	22.5–23	22.5–23
25 to 40 p.p.	23 (1)	23 (1)
150-160 Vis. E	22 (1)	22 (1)
120 Vis. D: 0 to 10 p.p.	22 (2)	22 (2)
600 S.R. Dark Green	8.5 (1)	8.5 (1)
600 S.R. Olive Green	10-11 (2)	10-11 (2)
631 S.R.	....	....
Black Oil	....	....

NOTE: Discounts of 0.5c to 1c on bright stock and 0.5c to 2c allowed for neutrals, 10 car lots, and to "meet competition." Brokers offering at greater discounts.

SOUTH TEXAS (Neutral Oils)		
Pale Oils (*Vis. at* 100°*F.*)		
Vis. Color		
100 No. 1½-2½	6.5	6.5
200 No. 2-3	8.75	8.75
300 No. 2-3	9.25	9.25
500 No. 2½-3½	10	10
750 No. 3-4	10.25	10.25
1200 No. 3-4	10.375	10.375
2000 No. 4	10.5	10.5

(Continued on next page)

NOTE—Parenthetical figures after prices indicate number of companies quoting when less than three companies are quoting.

NOTICE—Owing to great demand, refiners generally limit quotations to regular customers and refuse bids, though higher, from others. Refiners' prices and sales shown; bids reported in market leads.

Refinery Prices (Continued)

Prices in Effect	April 30	April 23
Red Oils:		
100 No. 5-6	6.5 (2)	6.5 (2)
200 No. 5-6	8.75	8.75
300 No. 5-6	9.25	9.25
500 No. 5-6	10	10
750 No. 5-6	10.25	10.25
1200 No. 5-6	10.375	10.375
2000 No. 5-6	10.5	10.5

CHICAGO (From Mid-Continent p.l. crude.) Neutral oils *sis. at 100° F. 0 to 10 p.p.*

Pale Oils Vis. Color		
60-85—No. 2	9 (1)	9 (1)
86-110—No. 2	9.25 (1)	9.25 (1)
150—No. 3	12.5 (1)	12.5 (1)
180—No. 3	13 (1)	13 (1)
200—No. 3	13 (1)	13 (1)
250—No. 3	14 (1)	14 (1)
Red Oils:		
180—No. 5	13 (1)	13 (1)
200—No. 5	13 (1)	13 (1)
250—No. 5	14 (1)	14 (1)
280—No. 5	15 (1)	15 (1)
300—No. 5	15.5 (1)	15.5 (1)

Note: Viscous oils, 15 to 30 p.p. are quoted 0.5c lower; 60-85 and 86-110 No. 2 non-viscous oils, 15 to 30 p.p., 0.25c lower.

Unfiltered Steam Refined (*Viscosity at 210°*)		
140	11.5 (1)	11.5 (1)
160	12.5 (1)	12.5 (1)
200	13.5 (1)	13.5 (1)

Bright stocks, 160 *sis. at* 210 *No.* 8 *color*:		
0 to 10 p.p.	24 (1)	24 (1)
15 to 25 p.p.	23.5 (1)	23.5 (1)
30 to 40 p.p.	21.5 (1)	21.5 (1)
E filtered Cyl. Stock	15.5 (1)	15.5 (1)

Note: To obtain prices delivered in Chicago add 0.25c per gal.

Natural Gasoline

(Group 3 & Breckenridge prices are to blenders on freight basis shown below. Shipments may originate in any Mid-Continent manufacturing district.)

FOB GROUP 3		
Grade 26-70	4.5 (Quotes)	4.5 (Sales)
FOB BRECKENRIDGE		
Grade 26-70	4.125-4.375(Quotes)	4.125 (Sale)

CALIFORNIA (FOB plants in Los Angeles basin)

21 pound vapor pressure for blending	4.75 - 5.375	4.75 - 5.375

Naphtha and Solvent

(*FOB Group* 3)

Stoddard solvent	6.625	6.625
Cleaners' naphtha	7.125	7.125
V.M.&P. naphtha	7.1 - 7.125	7.1 - 7.125
Mineral spirits	6.1 - 6.125	6.1 - 6.125
Rubber solvent	7.1 - 7.125	7.1 - 7.125
Lacquer diluent	7.375- 8.125	7.375- 8.125
Benzol Diluent	7.875- 8.625	7.875- 8.625
WESTERN PENNA.		
Other Districts:		
Untreated naphtha	7 -7.25 (2)	7 -7.25 (2)
Stoddard solvent	7.25 -7.5	7.25 -7.5

OHIO (S. O. quotations for statewide delivery:)

V.M.&P. naphtha.	D.C. naphtha,	Varnolene &
Sohio solvent	10	10
Rubber solvent	9	9

Wax

WESTERN PENNA. (Bbls. C.L.)

White Crude Scale:		
122-124 A.m.p.	4.25 (2)	4.25 (2)
124-126 A.m.p.	4.25	4.25

OKLAHOMA (C.L. FOB Refinery)

Semi-refined:		
128 AMP min., white, 50 kilo bags	No Price	No Price
132-134 AMP, bbls.	5.25 (1)	5.25 (1)

CHICAGO (FOB Chicago district refinery of one refiner, in bags, carloads. Carloads, slabs loose, 0.4c less. Melting points are EMP (ASTM) methods; add 3° to convert into AMP.)

Fully refined:		
122-124 (bags only)	5.6	5.6
125-127	6	6
127-129	6.25	6.25
130-132	6.55	6.55
132-134	6.8	6.8
135-137	7.55	7.55

Petrolatums

WESTERN PENNA. (Bbls., carloads; tank cars, 0.5c per lb. less.)

Snow White	6.125- 7.25	6.125- 7.25
Lily White	5.375- 6.25	5.375- 6.25
Cream White	4.375- 5.5	4.375- 5.5
Light Amber	3.375- 4	3.375- 4
Amber	3.125- 3.75	3.125- 3.75
Red	3 - 3.5	3 - 3.5

Tank Wagon Prices

Commercial or consumer tank car, tank wagon, dealer, and service station prices for gasoline **do not include taxes;** *they do, however, include inspection fees as shown in general footnote. Gasoline taxes, shown in separate column, include 1.5c federal, and state taxes; also city and county taxes as indicated in footnotes. Kerosine tank wagon prices also do not include taxes; kerosine taxes where levied are indicated in footnotes. Dealer discounts are shown in footnotes. These prices in effect April 30, 1945 as posted by principal marketing companies at their headquarters offices, but subject to later correction.*

S. O. N. J.

	Esso (*Regular Grade*) Consumer Tank Wagon	Dealer T.W.	Gaso- line Taxes	Kero- sine T.W.
*Atlantic City, N. J.	10.2	10.7	4.5	10
*Newark, N. J.	10.2	10.7	4.5	10
Annapolis, Md.	10.55	11.05	5.5	....
Baltimore, Md.	9.95	10.45	5.5	10.8
Cumberland, Md.	11.35	11.85	5.5	12.3
Washington, D. C.	10.2	10.7	4.5	11.3
Danville, Va.	11.65	12.15	6.5	12.55
Norfolk, Va.	10.45	10.95	6.5	12.3
Petersburg, Va.	10.75	11.25	6.5	13.3
Richmond, Va.	10.75	11.25	6.5	13.3
Roanoke, Va.	11.95	12.45	6.5	12.8
Charleston, W. Va.	11.65	12.15	6.5	13.1
Parkersburg, W. Va.	10.95	11.45	6.5	12.8
Wheeling, W. Va.	10.95	11.45	6.5	13.4
Charlotte, N. C.	11.70	12.20	7.5	11.3
Hickory, N. C.	12.25	12.75	7.5	12.3
Mt. Airy, N. C.	12.10	12.6	7.5	11.5
Raleigh, N. C.	11.45	11.95	7.5	12.3
Salisbury, N. C.	11.75	12.25	7.5	12.7
Charleston, S. C.	10.55	11.05	7.5	....
Columbia, S. C.	11.40	11.9	7.5	....
Spartanburg, S. C.	12.1	12.6	7.5	....
New Orleans, La.	8.75	9.25	8.5	10.00
Baton Rouge	8.75	9.25	8.5	10.50
Alexandria	8.75	9.25	8.5	10.50
Lake Charles	9.00	9.50	8.5	12.00
Shreveport	8.50	9.00	8.5	9.00
Knoxville, Tenn.	10.50	11.00	8.5	12.50
Memphis	8.90	9.40	8.5	10.50
Chattanooga	10.50	11.00	8.5	11.00
Nashville	10.50	11.00	8.5	10.00
Bristol	10.95	11.45	8.5	13.10
Little Rock, Ark.	9.50	10.00	8.0	10.00

	Mineral Spirits T.W.	V.M.&P. T.W.
Newark, N. J.	13	14.5
Baltimore, Md.	15.5	....
Washington, D. C.	15.5	....

Fuel Oils—T.W.	No. 1	No. 2	No. 3
Atlantic City, N. J.	10	9	9
Newark	10	9	9
Annapolis, Md.	..	..	..
Baltimore	9.8	9	9
Washington, D. C.	10.3	9.4	9.4
Norfolk, Va	10	8.8	8.8
Petersburg	10.3	9	..
Richmond	10.3	9	9
Charlotte, N. C.	10.3	10.1	..
Hickory, N. C.	..	9.7	..
Raleigh	11.3	9.8	..
Charleston, S. C.	..	8.7	..
Columbia	..	9.7	..
Spartanburg	..	10.5	..

*Effective Aug. 5, '42 minimum retail resale price of 14.2c posted thru New Jersey. Discounts:

Esso gasoline—to undivided dealers, 0.5c off dealer t.w.

Kerosine—1c off t.w. price for 25 gals. or more, under contract thru territory (Baltimore city contract not necessary) except no discount in state of New Jersey.

Naphtha—To buyers taking following quantities at one time: Newark, 2c per gal. on 200 gals. or more, less than 200 gals. 0.5c higher price; Baltimore, 2c off on 25 to 100 gals. and 3c on over 100 gals.; Washington, 2c off to contract buyers.

Notice

These prices include inspection fees on both gasoline and kerosine unless otherwise specified per gallon as follows:

Ala. 1/40c on gasoline; Ark 1/20c; Fl. 1/8c; Ill. 3/100c; Ind. 1/5c in lots of 25 bbls. or less, 2/25c in lots of more than 25 bbls.; Kans. 1/50c; La. 1/32c; Minn. 7/200c; Miss. 1/50c; Neb. 3/100c; Nev. 1/20c; N. C. 1/4c; N. Da. 1/20c; Okla. 2/25c; S. Car. 1/8c; S. Da. 1/20c; Tenn. 2/5c; and Wisc. 3/100c.

Kerosine inspection fees only: Ala. 1/2c; Fla. 1/8c; Iowa 3/50c; Mich. 1/5c per gal.

CONT'L OIL

	Conoco Bronz-z-z Tank	De- mand (*3rd Grade*) Wagon	Gaso- line Taxes	Kero- sine T.W.
Denver, Col.	10	9	5.5	10
Grand Junc., Col.	12.5	11.5	5.5	12.5
Pueblo, Col.	9.5	8.5	5.5	9.5
Casper, Wyo.	11.5	10.5	5.5	12
Cheyenne, Wyo.	10	9	5.5	9
Billings, Mont.	12	11	6.5	12.5
Butte, Mont.	11.5	10.5	6.5	13.5
Great Falls, Mont.	12	11	6.5	12.5
Helena, Mont.	12	11	6.5	13
Salt Lake City, Utah	13.5	12.5	5.5	14.5
Boise, Ida.	14.5	13.5	7.5	16.5
Twin Falls, Ida.	15.5	14.5	7.5	17
Albuquerque, N. M.	10.5	9.5	*7	9.5
Roswell, N. M.	10	9	*7	7
Santa Fe, N. M.	10.5	9.5	*7.5	10
Ft. Smith, Ark.	9	6.25	*7	8
Texarkana, Ark.	9	7.5	*5.5	7
Muskogee, Okla.	7.75	6.75	7	8
Oklahoma City, Okla.	8	7	7	8
Tulsa, Okla.	8	7	7	8

*Taxes: In gasoline tax column are included these city taxes—Albuquerque, & Roswell, 0.5c, Santa Fe, 1c. Texas 4c state tax applies within city limits of Texarkana, Ark.; Okla., 5.5c state applies within city limits of Ft. Smith, Ark.

†To consumers & Dealers.

NOTE: Current selling price—where this is lower than maximum price it is because of local competition. It is the actual selling price and is subject to revision due to delays in receiving information from the field.

S. O. CAL.

	Standard Posted Net Tank Truck	Standard Posted Retail	Flight Posted Net Tank Truck	Flight Posted Retail	Gaso- line Taxes
San Francisco, Cal.	10	14	9	12	4.5
Los Angeles, Cal.	9.5	13.5	8.5	11.5	4.5
Fresno, Cal.	11	15	10	13	4.5
Phoenix, Ariz.	12	16	10	13	6.5
Reno, Nev.	12	16	11	14	5.5
Portland, Ore.	10.5	14.5	9.5	12.5	6.5
Seattle, Wash.	10.5	14.5	9.5	12.5	6.5
Spokane, Wash.	12.5	16.5	11.5	14.5	6.5
Tacoma, Wash.	10.5	14.5	9.5	12.5	6.5

Standard Gasoline (*Regular Grade*)
Flight Gasoline (*Third Grade*)

***Chevron Aviation 73**

	Posted Net Tank Truck	Gasoline Taxes	Kerosine Tank Truck
San Francisco, Cal.	12.5	4.5	11.5
Los Angeles, Cal.	12	4.5	10
Fresno, Cal.	13.5	4.5	12.5
Phoenix, Ariz.	14.5	6.5	12.5
Reno, Nev.	14.5	5.5	13.5
Portland, Ore.	13	6.5	13.8
Seattle, Wash.	13	6.5	13.8
Spokane, Wash.	16	6.5	16.8
Tacoma, Wash.	13	6.5	13.8

Resale and Commercial Gasoline: Tank car deliveries of Standard Aviation 73, Standard's Supreme and Flight Gasoline .25c per gal. below posted net tank truck price. Tank car deliveries of Standard Gasoline .375c per gal. below posted net tank truck price. Pearl Oil (The Standard Kerosene) Tank car deliveries 3c below posted tank truck price.

*Formerly Standard Aviation 73.

TEXAS CO.

	Gasoline—Dealer T.W. Fire-Chief (Regular)	Indian (*3rd Grade*)	Gaso- line Taxes
Dallas, Tex.	7.5	6.5	5.5
Ft. Worth, Tex.	7.5	6.5	5.5
Wichita Falls, Tex.	8.5	7.5	5.5
Amarillo, Tex.	8.5	7.5	5.5
Tyler, Tex.	8.5	7.5	5.5
El Paso, Tex.	11	10.5	5.5
San Angelo, Tex.	8.5	7.5	5.5
Waco, Tex.	8.5*	7*	5.5
Austin, Tex.	8.5	7.5	5.5
Houston, Tex.	8.5	7.5	5.5
San Antonio, Tex.	8.5	7.5	5.5
Port Arthur, Tex.	8.5	7.5	5.5

*Less 1c temporary allowance to all dealers.

(Continued on next page)

Tank Wagon Prices—Continued

S. O. IND.

	Red Crown Blue Crown Red Dealer Prices		(*Regular Grade*) (*Third Grade*)		
	Crown Cons. T.W.	Red Crown	Blue Crown	Gaso- line Taxes	Kero- sine T.W.
Chicago, Ill.	11.6	9.6	9.1	4.5	10.6
Decatur, Ill.	11.6	9.6	8.7	4.5	10.3
Joliet, Ill.	11.9	10.3	9.2	4.5	10.6
Peoria, Ill.	11.7	9.9	9.7	4.5	10.4
Indianapolis, Ind.	11.6	10.1	9.6	5.5	10.1
Evansville, Ind.	11.4	9.9	8.6	5.5	9.9
South Bend, Ind.	12	10.5	10	5.5	10.5
Detroit, Mich.	11.4	9.9	...	4.5	10
Grand Rapids, Mich.	11.4	9.9	...	4.5	9.9
Saginaw, Mich.	11.4	9.9	...	4.5	9.9
Green Bay, Wis.	12.2	10.7	10.2	5.5	10.9
Milwaukee, Wis.	12.1	10.6	10.1	5.5	10.8
La Crosse, Wis.	11.9	10.4	9.9	5.5	10.6
Minneapolis - St. Paul	11.9	10.4	9.9	5.5	10.6
Duluth, Minn.	12.2	10.7	10.2	5.5	10.9
Mankato, Minn.	11.9	10.4	9.9	5.5	10.6
Des Moines, Ia.	11.4	9.9	9.4	4.5	*10.1
Mason City, Ia.	11.7	10.2	9.7	4.5	*10.4
St. Louis, Mo.	11.0	9.5	9.3	*4.5	10.1
Kansas City, Mo.	11.0	9.5	8.6	*4.5	9.7
St. Joseph, Mo.	11.2	9.7	9.2	*4.5	9.9
Fargo, N. D.	12.9	11.4	10.9	5.5	11.6
Huron, S. D.	12.3	10.8	10.3	5.5	11
Wichita, Kans.	10.3	8.8	7.2	4.5	9.0
Omaha, Neb.	11.4	9.6	9.4	6.5	10.1

	Oleum Spirits	V.M.&P. Naphtha	Stani-sol	*Taxes
	(Prices are base prices before discounts)			
Chicago	13.5	13.8	12.8	4.5
Detroit	15.8	15	16.3	4.5
K. C., Mo.	13.3	14.3	13.8	1.5
St. Louis, Mo.	13.7	14.7	13.2	1.5
Milwaukee	14.4	15.4	14.9	5.5
Minnep'ls	14.2	15.2	13.5	5.5

Fuel Oils T.W. Chicago	Standard Heater Oil	Stanolex Furnace Oil
1-99 gals.	9.3	8.8
100-149 gals.	8.3	7.8
150 gals. & over	7.8	...
150-399 gals.	...	7.8
400 gals. & over	...	7.3

	Stanolex Fuel A	Stanolex Fuel C
1-749 gals.	6.5	6.0
750 gals. & over	5.75	5.25

Stanolex Furnace Oil Other Points	1-99 gals.	100 gals. & over
Indianapolis	9.0	8.0
Detroit	8.7	7.7
Milwaukee	9.0	8.0
Minneapolis	9.1	8.1
St. Louis	8.4	7.4
Kansas City	8.1	7.1

*Taxes: In gasoline tax column are included these city taxes—Kansas City, St. Joseph and St. Louis, 1c. Iowa kerosine prices are ex 3c state tax. In naphtha tax column are included 1.5c federal tax and state taxes.

State sales, occupation, consumer and use taxes to be added when applicable.

S. O. OHIO

	*Sohio X-70 Gasoline (*Regular Grade*) Consumer T.W.	**Re-sellers	‡S.S.	Gaso- line Taxes	†Kero-sine T.W.
Ohio, Statewide	12	10	13.5	5.5	9.3
Akron	12	9.5	12.5	5.5	9.3
Canton	12	9.5	12.5	5.5	9.3
Cincinnati	12	9.5	12.5	5.5	9.3
Cleveland	12	9.5	12.5	5.5	9.3
Columbus	12	9.5	12.5	5.5	9.3
Dayton	12	9.5	12.5	5.5	9.3
Lima	12	9.5	12.5	5.5	9.3
Mansfield	12	9.5	12.5	5.5	9.3
Marion	12	9.0	12.0	5.5	9.3
Portsmouth	12	9.5	12.5	5.5	9.3
Toledo	12	9.5	12.5	5.5	9.3
Youngstown	12	9.5	12.5	5.5	9.3
Zanesville	12	9.5	12.5	5.5	9.3

Aviation Gasoline—Statewide

	Consumer Gasoline T.W.	Taxes
Sohio Aviation Gasoline clear Spec. AN-F-22	14.5	5.5
Esso Ethyl Aviation 73 Oct.	15.5	5.5
Esso Ethyl Aviation 80 Oct.	16.5	5.5
Esso Ethyl Aviation 91 Oct.	17.5	5.5
Esso Ethyl Aviation 100 Oct.	24.5	5.5

	Naphtha—T.W. Statewide	Lucas County
S. R. Solvent	13.5	13.5
D. C. Naphtha	14.5	14.25
V.M.&P. Naphtha	14.5	14.25
Varnolene	14.5	14.25
Sohio Solvent	14.5	14.25

Fuel Oils—T.W.	No. 1	No. 2	No. 3	No. 4
Ohio, Statewide	8.3	8.3	7.8	*7.55

*Renown (third-grade) prices are same as X-70 unless otherwise noted.

**Except authorized agents.

‡Prices at company-operated stations.

††Statewide prices are subject to exceptions other than those shown.

Discounts:

Esso aviation—on contract to hangar operators and resellers, 2c off consumer t.w.

*For Cleveland area only. Full compartment hose dumps.

Fuel oils—Statewide prices are for t.w. & drum deliveries of 50 gals. or more; prices for deliveries of less than 50 gals. are 0.5c higher.

Naphthas—to contract consumers off t.w. prices—Statewide: 300 to 999 gals., 0.5c; 1000 to 2499 gals., 0.75c; 2500 to 4999 gals., 1c; 5000 or more gals., 1.5c. Lucas County: Less than 50 gals., tank wagon price, 50 to 249 gals., 0.5c; 250 to 499 gals., 1c; 500 gals. or over, 1.5c.

ATLANTIC REFINING

	Atlantic White Flash (*Regular Grade*) Commercial T.W.	Dealer T.W.	Gaso-line Taxes	Kero-sine T.W.
Philadelphia, Pa.	10.2	10.7	5.5	12.25
Pittsburgh	10.1	10.6	5.5	12.1
Allentown	10.7	11.2	5.5	12.6
Erie	10.1	10.6	5.5	12.1
Scranton	10.7	11.2	5.5	12.6
Altoona	10.7	11.2	5.5	12.6
Emporium	10.1	10.6	5.5	12.1
Indiana	10.7	11.2	5.5	12.6
Uniontown	10.1	10.6	5.5	12.1
Harrisburg	10.7	11.2	5.5	12.6
Williamsport	10.7	11.2	5.5	12.6
Dover, Del.	....	11.2	5.5	12.6
Wilmington, Del.	....	10.7	5.5	12.1
Boston, Mass.	....	10.9	4.5	....
Springfield, Mass.	....	11.8	4.5	....
Worcester, Mass.	....	11.5	4.5	....
Fall River, Mass.	....	11	4.5	....
Hartford, Conn.	....	11.6	4.5	....
New Haven, Conn.	....	11	4.5	....
Providence, R. I.	....	11	4.5	....
Atlantic City, N. J.	....	10.7	4.5	10
Camden, N. J.	....	10.7	4.5	10
Trenton, N. J.	....	10.7	4.5	10
Annapolis, Md.	....	11.05	5.5	10.8
Baltimore, Md.	....	10.45	5.5	9.8
Hagerstown, Md.	....	11.55	5.5	10.3
Richmond, Va.	....	11.25	6.5	12.3
Wilmington, N. C.	....	11.15	7.5	11.6
Brunswick, Ga.	....	10.1	7.5	10.6
Jacksonville, Fla.	....	10.1	8.5	11.6

	Mineral Spirits T.W.†	V.M.&P. T.W.†
Philadelphia, Pa.	11	12.5
Lancaster, Pa.	12	13.5
Pittsburgh, Pa.	12.5	13.5

	Fuel Oils—T.W. 1	2	3	5	6
Phila., Pa.	10.1	9	9	5.76	5.04
Allentown, Pa.	10.6	9.3	9.3	....	....
Wilmington, Del.	10.1	9	9	....	....
Springfield, Mass.	10.2	9.4	9.4	....	....
Worcester, Mass.	10.2	9.3	9.3	....	....
Hartford, Conn.	10.5	9.2	9.2	....	....

‡Does not include 1c Georgia kerosine tax.

†Mineral Spirits prices also apply to Stoddard Solvent; V.M.&P. prices also apply to Light Cleaners Naphtha.

Discounts:

Gasoline—to undivided dealers, 0.5c off dealer t.w. except Georgia & Florida dealer t.w. and undivided dealer t.w. prices are same.

Kerosine—Thru Penna. & Delaware, 2c off t.w. price on t.w. deliveries of 25 gals. or more at one time.

S. O. KY.

	Crown Gasoline (*Regular*) Standard (*Third Grade*) †Net Crown	Gaso-line Taxes	Kero-sine T.W.
Covington, Ky.	9.5	6.5	9.3
Lexington, Ky.	10.5	6.5	9.3
Louisville, Ky.	10	6.5	8.8
Paducah, Ky.	10	6.5	8.8
Jackson, Miss.	10	7.5	*9
Vicksburg, Miss.	9.5	7.5	*8.5
Birmingham, Ala.	10	*8.5	9
Mobile, Ala.	9	*9.5	8.5
Montgomery, Ala.	10	*9.5	*10
Atlanta, Ga.	11.1	7.5	*11.6
Augusta, Ga.	11.1	7.5	*11.1
Macon, Ga.	11.1	7.5	*11.6
Savannah, Ga.	10.1	7.5	*10.6
Jacksonville, Fla.	10.1	8.5	9.6
Miami, Fla.	10.1	8.5	9.6
Pensacola, Fla.	9	*9.5	8
Tampa, Fla.	10.1	8.5	9.6

*Taxes: In tax column are included these city and county gasoline taxes: Mobile, 2c city; Birmingham, 1c city, Montgomery, 1c city and 1c county; Pensacola, 1c city. Georgia and Montgomery, Ala. have 1c kerosine tax, Mississippi 0.5c, included in above prices.

†Consumer t.w. prices are same as net dealer prices.

HUMBLE OIL

	Humble Thriftane *Tank Wagon	Re-tail	Thriftane *Tank Wagon	Re-tail	(*Third Grade*) Thriftane Gaso-line Taxes
Dallas, Tex.	7.5	10.5	6.5	10.5	5.5
Ft. Worth, Tex.	6.5	9.5	6	7.5	5.5
Houston, Tex.	8.5	12.5	7.5	10.5	5.5
San Ant., Tex.	8.5	12.5	7.5	10.5	5.5

Humble Motor Fuel (*Regular Grade*)

Consumer tank wagon prices are 1c per gal. above the dealer tank wagon prices at Dallas and Ft. Worth.

	Kerosine *Tank Wagon	Retail
Dallas, Tex.	7	10
Ft. Worth, Tex.	7	11
Houston, Tex.	8	11
San Antonio, Tex.	7	10

*To all classes of dealers & consumers.

Canada

PRICES OF IMPERIAL OIL, LTD.

Per Imperial Gallon, which is 1.2 U. S. Gallons

IMPERIAL OIL

	3-Star Imperial Gasoline (*Regular Grade*) †Gasoline T.W.	*Gasoline Taxes	Kero-sine T.W.
Hamilton, Ont.	16.5	11	18
Toronto, Ont.	16.5	11	18
Brandon, Man.	20.5	10	23
Winnipeg, Man.	20.0	10	22.5
Regina, Sask.	17.5	10	20
Saskatoon, Sask.	20.3	10	22.8
Edmonton, Alta.	18.4	10	20.9
Calgary, Alta.	15.5	10	18
Vancouver, B. C.	15	10	24
Montreal, Que.	16.5	11	17.5
St. John, N. B.	16	13	19
Halifax, N. S.	16	13	19

*Includes 3c Federal, and Provincial taxes.

†To divided & undivided dealers.

Absorption Gasoline—No. 26 R.V.P.—$2.28. Gasoline prices effective Oct. 7.

SOCONY VACUUM

	Socony Mobilgas (*Regular Grade*) Com. Cons. T.W.	Undiv. Dlr. T.W.	Gaso-line Taxes
New York City			
Manhattan & Bronx	10.1	10.6	*5.5
Kings & Queens	10.1	10.6	*5.5
Richmond	9.7	10.2	*5.5
Albany, N. Y.	9.9	10.4	5.5
Binghamton, N. Y.	11	11.5	5.5
Buffalo	9.6	10.1	5.5
Jamestown, N. Y.	9.8	10.3	5.5
Mt. Vernon, N. Y.	10.1	10.6	5.5
Plattsburg, N. Y.	11	11.5	5.5
Rochester, N. Y.	10.8	11.3	5.5
Syracuse, N. Y.	10.5	11	5.5
Bridgeport, Conn.	10	10.5	4.5
Danbury, Conn.	10.5	11	4.5
Hartford, Conn.	10.6	11.1	4.5
New Haven, Conn.	10	10.5	4.5
Bangor, Me.	10.7	11.2	5.5
Portland, Me.	10.3	10.8	5.5
Boston, Mass.	9.9	10.4	4.5
Concord, N. H.	11.4	11.9	5.5
Lancaster, N. H.	12	12.5	5.5
Manchester, N. H.	11.3	11.8	5.5
Providence, R. I.	10	10.5	4.5
Burlington, Vt.	10.9	11.4	5.5
Rutland, Vt.	11	11.5	5.5

(Continued on next page)

Seaboard Export Coastwise Prices

Atlantic Coast

(Prices are of refiners, FOB their refineries & their tanker terminals, & of tanker terminal operators FOB their terminals)—Prices in Effect April 30.

MOTOR GASOLINE

District	72 Oct. (ASTM)	70-74 oct. (ASTM)	KEROSINE and /or NO. 1 FUEL
N. Y. Harb.	Not made	9.075	7.1
N. Y. Harb., barges	"	8.5 – 8.975	7
Albany	"	9.175	7.3
Philadelphia	"	9.075	7.2
Baltimore	"	8.825	7.2
Norfolk	"	8.575	7.1
Wilmington, N. C.	"	8.175	6.75
Charleston	"	8.175	6.9
Savannah	"	7.845	6.55
Jacksonville	"	7.845	6.55
Miami	"	7.845	6.55
Tampa	"	7.845	6.55
Pensacola	"	6.875 (1)	4.8 (1)
Mobile	"	6.62 – 6.745	4.75 (2)
New Orleans	"	6.125 (1)	4.125–4.25
Portland	"	9.375	7.3
Boston	"	9.275	7.2
Providence	"	9.275	7.2

(a) Price is for straight-run low pour, test No. 5 ($1.95)

Pacific Export

In Ship's Bunkers, or deep tank lots:

Prices in Effect	April 30	April 23
Diesel Fuel, Pac. Spec. 200	$1.45	$1.45
Grade C fuel, Pac. Spec. 400	$1.10	$1.10

FUEL OILS

	No. 2	No. 3	No. 5	No. 6
New Haven	6.7	6.7	$1.85–$1.95(a)	$1.77
N. Y. Harbor	6.6	6.6 (2)	....	....
Albany	6.8	6.8	....	$1.97 (1)
Philadelphia	6.7	6.7	$1.98	$1.77
Baltimore	6.7	6.7	$1.85 (1)	$1.77
Norfolk	6.7	6.7 (1)	$1.85 (1)	$1.77
Charleston	6.4	....	....	....
Savannah	6.4 (2)	....	$1.80 (1)	$1.72 (2)
Jacksonville	5.75 (1)	....	....	$1.72 (1)
Tampa	5.75	....	....	$1.72 (2)
New Orleans	5.75 (1)	....	....	....
Portland	5.75	....	....	$1.62
Boston	....	....	....	....
Providence	....	....	....	....
	3.75 (2)	....	$1.05–1.25(1*)	$0.97
	6.8	6.8 (2)	....	$1.77
	6.7	6.7 (2)	$1.95 (2)	$1.77
	6.7	6.7 (2)	$1.90 (1)	$1.77

Tank Wagon Prices (Continued)

	Mineral Spirits T.W.	V.M.&P. T.W.
Buffalo, N. Y.	12.4	13.6
New York City	11	12
Rochester, N. Y.	13.2	14.4
Syracuse, N. Y.	14	....
Boston, Mass.	12	13
Bridgeport, Conn.	†16.3	†17.3
Hartford, Conn.	†16.3	†17.3
Providence, R. I.	13	14

	Kero-sine Yard	Kero-sine T.W.	Mobil-fuel Diesel T.C.	Mobil-fuel Diesel T.W.	Mobil-heat Fuel Yard	Mobil-heat Fuel T.W.
New York:						
Manhat'n & Bronx	7.5	10.3	...	9.3	7.1	9
Kings & Queens	7.5	10.3	...	9.3	7.1	9
Richmond	7.5	10.3	...	...	7.1	9.0
Albany	7.5	9.8	6.8	9.3	7	9
Binghamton	8.9	11.2	...	10.7	8.4	10.2
Buffalo	8.1	10.4	7.5	9.8	7.7	9.5
Jamestown	8.2	10.5	...	10.1	7.8	9.5
Mt. Vernon	7.6	10.3	...	9.4	7.2	9
Plattsburg	8.1	10.4	...	9.9	7.6	9.4
Rochester	8.7	11	7.9	10.2	7.9	9.7
Syracuse	8.5	10.8	7.8	10.1	7.8	9.6
Conn.:						
Bridgeport	7.8	10.3	...	....	7.3	9.0
Danbury	8.2	10.8	...	....	7.8	8.5
Hartford	8.0	10.5	...	9.5	7.4	9.2
New Haven	7.5	10.3	...	9.3	7.1	9.0
Maine:						
Bangor	7.9	10.3	7.4	9.7	7.4	9.1
Portland	7.5	10.2	6.8	9.3	7	9
Mass.:						
Boston	7.8	10.6	6.7	9.2	7.1	9
N. H.:						
Concord	8.4	10.7	...	...	8.2	10
Lancaster	9.5	11.8	...	....	9.2	11
Manchester	8.5	11.1	...	....	7.9	9.7
R. I.:						
Providence	7.8	10.1	6.7	9.2	7.1	9.0
Vermont:						
Burlington	8.1	10.4	7.5	9.8	7.5	9.2
Rutland	8.3	10.6	...	10	7.7	9.5

*Does not include 1% city sales tax applicable to price of gasoline (ex tax).

†In steel barrels

Discounts: Diesel—On t.w. deliveries, 0.5c for at least 400 gals.; 1c for full tank truck.

EXPORT PRICES

Effective April 30

	Mexican Gulf Ports U. S. Dollars per Bbl. Bunker C	Diesel
Tampico	$0.97	$1.65
Veracruz	0.97	....
Coatzacoalcos	0.97	1.65
	Pacific Coast	
Guaymas	$1.50	$3.22
Masatlan	1.50	3.22
Acapulco	1.50	2.89
Manzanillo	1.50	2.89
Salina Cruz	1.50	2.89

	Bunker C Fuel Ships' bunkers (Ex Lighterage)	Diesel Oil Ships' bunkers (Ex Lighterage)	Diesel Oil Shore Plants	Gas House Gas Oil 28-34 Gravity
New Haven	$1.77	....	....	....
N. Y. Harbor	$1.77	$2.78	6.7 (1)	6.8 (2)
Albany	$1.97 (1)	$2.94 (1)	6.8 (1)	7 (1)
Philadelphia	$1.77	$2.78	....	....
Baltimore	$1.77	$2.78	6.7 (1)	6.7 (1)
Norfolk	$1.77	$2.78	6.7 (1)	6.7 (1)
Charleston	$1.72 (2)	$2.65 (2)	6.4 (1)	6.4 (1)
Savannah	$1.72 (1)	$2.52 (1)	....	....
Jacksonville	$1.72 (2)	$2.41 (2)	....	....
Tampa	$1.62	$2.41 (2)	....	....
New Orleans	$0.97	$1.65 (1)	4 (1)	....
Portland	$1.77	....	6.8 (1)	6.9 (1)
Boston	$1.77	$2.78 (2)	6.7 (2)	6.8 (2)
Providence	$1.77	$2.78 (2)	6.7 (1)	6.8 (1)

Bunker "C" when from Navy storage at New York and Norfolk to out-going vessels ships .05c discount. (Subject to cancellation.)

*—$1.05 semi-refined; 1.25—100% distillate.

Gulf Coast

Prices in Effect April 30

MOTOR GASOLINE	New Orleans & Lower Mississippi to Baton Rouge Tank Cars	New Orleans & Lower Mississippi to Baton Rouge Barges	Texas Gulf Coast South of New Orleans Tank Cars	Texas Gulf Coast South of New Orleans Barges	CARGOES Domestic & Export From all Gulf Ports
Leaded (oct. by ASTM)					
76 oct.	6.75	6.5	6.75	6.75	6.75
70-74 oct.	6 – 6.125	5.625	5.625–6.375 (a)	5.625	5.625
63-65 oct.	....	....	....	....	....
Unleaded 70 oct.	....	....	....	....	5.625
67-68 oct.	....	....	....	....	....
65 oct.	....	....	....	....	5.25
60 oct.	....	....	....	....	5
KEROSINE & LIGHT FUELS					
41-43 w.w. kero.	4.125– 4.25	4.125	4.125– 4.25	4.125	4.125
42-44 w.w. kero.	....	....	4.125	4.125	4.125
No. 2 fuel oil	3.75	3.75	3.75 – 4	3.75	3.75
DIESEL & GAS OILS					
(In diesel index No.)					
Below 43 di.	....	....	....	....	....
43-47 di.	....	....	....	....	4
48-52 di.	4	4	4	....	4
53-57 di.	4.125	....	4.125	4.125	4.125
58 and above	4.25	....	4.25	....	4.25

(a) 5.625c for Dist. 1 and 6.125-6.375c for other districts.

NOTE: Above products in Truck Transports of 2,400 gal. and over ½c above Tank Car Prices.

Heavy Fuels & Bunker Oil (at all Gulf Ports) Heavy Diesels	In Cargoes	In Ship's Bunkers (Ex Lighterage)
Below 28 API Grav.	....	$1.35
28 & above API Grav.	....	$1.65
Bunker C Oil	$0.97	$0.97

Mid-Continent Lubes

(At Gulf; in packages, FAS.; in bulk, FOB terminals).

Prices in Effect April 30

	Steel Drums	Bulk
Bright Stock		
D color, Vis at 210°		
200 vis.	....	....
150 vis., 0-10 p.p.	32.65 (1&a)	24.8 (1)
100 vis., 0-10 p.p.	....	....
100 vis., 10-25 p.p.	....	....
Neutral—No. 3 color		
200 vis., 0-10 p.p.	....	....

(A) FAS at New Orleans.

Wax

(Melting points are AMP. 3° higher than EMP) Prices are FOB refinery and do not include bag: freight or export differentials).

Prices in Effect April 30

Crude Scale	New Orleans Export	N. Y. Domestic	N. Y. Export
124-6 Yellow	4.25 (1)	....	4.25 (1)
122-4 White	....	4.25 (2)	4.25 (2)
124-6 White	4.25 (1)	4.25	4.25
Fully Refined:			
123-5	5.2 (1)	5.2 (2)	5.2 (1)
125-7	5.2 (1)	5.2 (2)	5.2 (1)
128-30	5.6 (1)	5.6	5.6 (1)
130-32	5.85 (1)	5.85 (2)	5.85 (1)
133-5	6.15 (1)	6.15	6.15 (1)
135-7	6.4 (1)	6.4 (1)	6.4 (1)

Naphtha

Prices in Effect April 30

	V.M.&P. Naphtha	Mineral Spirits
New York Harbor	11 (2)	10
Philadelphia	11 (2)	10
Baltimore	10.5 (2)	9.5
Boston	11.5 (2)	10.5
Providence	11.5 (1)	10.5 (2)

CLASSIFIED

For Sale

FOR SALE: Oil Company established eighteen years in eastern New York state, with combined output of petroleum products of over five million gallons. Parties interested write Box No. 582.

FOR SALE: 1939 Semi-trailer and Chevrolet tractor with unloading pump—3150 gallon—three compartment—double bulkheads. Rubber and mechanical condition good. Norco Oil Company, Cheboygan, Michigan. Phone 52.

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1941—614 Diamond T Truck, L.W. Base, 2 speed Eaton axle, 9:00 x 20 tires, 1350 gallon 3-compartment Standard Steel Tank mounted on truck. Barrel racks on each side. Pulling a 2,700 gallon Standard Steel Trailer, 3-compartment, Westinghouse air brakes, 9:00 x 20 tires on Dolly and Trailer.

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ABOUT OIL PEOPLE

J. Rodman Tompkins, of the publicity committee of the Oil Trade Assn. of Philadelphia, promises a big time for all at the Whitemarsh Country Club on June 5. The occasion is the association's annual spring golf tournament and dinner.

° ° °

H. C. Arnold, who has been vice president of the British-American Oil Producing Co. since 1938, will shortly become the vice president of the Ashland Oil & Refining Co., **J. Howard Marshall,** president, has announced. Mr. Arnold will be in charge of oil and gas exploration with headquarters at 417 National Bank of Tulsa Bldg., Tulsa, Okla.

° ° °

Mr. and Mrs. Bernard L. Snyder of North Muskegon, Mich., have been advised of the death of their son, **Pfc. Thomas (Tommy) Snyder,** 20, who was killed in action in Germany. He was with the engineers in the Second Armored, "Hell on Wheels" division, which spearheaded much of the 9th Army's drive into the Reich. **Bernard (Barney) Snyder** is sales-manager of the Naph-Sol Refining Co., and has another son, **Midshipman Bernard L. Snyder, Jr.,** who is now in his last year at Annapolis.

° ° °

First Lieut. Jerome F. Engs, formerly assistant credit manager for Tide Water Associated Oil Co. in San Francisco, has been awarded a fifth Oak Leaf Cluster to the Air Medal for meritorious achievement. He has flown more than 30 missions over Germany since entering the Army in 1943.

° ° °

George White Jr., who was in Manila for the Standard Vacuum Oil Co. when the Japs struck, now is back home in Los Angeles after being rescued from the Los Banos internment camp by U. S. troops. He was sales representative for the district of Panay and Negros islands.

° ° °

Alphonzo E. Bell, Los Angeles oil man, has sold the land on which the Hilton Hotel in Long Beach is located. Deal was made with the Stevens Hotel Corp. of Chicago for $400,000, it is reported.

° ° °

Calhoun Davis, with the Midstates Petroleum Corp. land forces in Wichita Falls, Tex., has been transferred as scout to the West Texas division with headquarters in Abilene.

° ° °

Several personnel changes in the Tulsa office of British American Oil Producing Co. have been announced. **C. D. Miller** has been made vice president and general manager of British American and first vice president of Toronto Pipe Line Co. **R. E. Kepke** also becomes a vice president of the producing company and general manager of the pipeline company. Formerly assistant to Mr. Miller, **C. J. Kerwin** is now general superintendent, with **J. J. Arps** as assistant general superintendent and chief engineer. **J. E. Watson** is in charge of the land department, and **T. C. Hoke** is in charge of exploration.

H. A. Ecklund, who was vice president and head of the land department in Tulsa, has been transferred to Los Angeles as vice president and head of the California land division.

° ° °

Resignation of **J. M. Nisbet** as vice president and manager of the land and geological division of Cities Service Oil Co., and the appointment of **R. L. Kidd** to succeed him as manager of the division has been announced by **H. R. Straight,** president. Mr. Nisbet will return to California June 1, where he will manage his citrus properties near Upland.

Mr. Nisbet

Mr. Kidd is a 20-year man with the company, having joined Cities Service in July 1925 as a member of the land department. A few months later, he was transferred to Madison, Kans., as development geologist. Through the intervening years, he served as resident geologist at Oil Hill, Kans., geologist for Cities Service Gas Co., chief geophysicist for Cities Service Oil Co., assistant chief geologist and, at the time of his elevation to the managership, he was chief geologist of the Bartlesville division.

Mr. Wilhelm

Mr. Kidd

A graduate of the University of Indiana in 1923, he is a members of the American Assn. of Petroleum Geologists, Society of Exploration Geophysicists, and the Tulsa Geological Society.

Mr. Nisbet began his career with Cities Service in 1916 after his graduation from Stanford University. His steady advancement from field geologist was twice interrupted—once, when he served in the U. S. Army during World War I, and for a three-year period ending in 1939 when he developed his Upland, Calif., citrus grove. After returning to company service in 1939 as manager of the land and geological division, he was made a director of Cities Service Oil Co. in 1940 and a director of Empire Pipeline Co. in 1943. He was elected vice president of Cities Service Oil Co. in the spring of 1943.

° ° °

J. C. Kennedy will continue as superintendent of the land department and **A. K. Wilhelm** will replace Mr. Kidd as chief geologist of the Bartlesville division.

° ° °

Charles E. McCulloch, for the past eight years manager of the petroleum refinery division of Foster Wheeler Corp., New York, was elected a director of that company, April 23. After graduating from Massachusetts Institute of Technology in 1926, he joined the National Carbon Division of Union Carbide and Carbon Corp. as an analytical chemist and later became a chemical engineer for Tide Water Oil Co. **William L. Martwick,** vice president in charge of general sales, and **Lee A. Swem,** the company's patent counsel, were also elected to the board of directors.

° ° °

Cecil L. True, True's Oil Co., Spokane, Wash., has announced the formation of True's Distributing Co., and its appointment as dealers for a line of pleasure and commercial boats in eastern Washington and northern Idaho.

True's Oil Co., founded in 1898 by L. L. True and his two sons, **Burt A.** and **Arthur L.,** is headed by **Arthur L. True** as president, **Cecil L. True,** vice president; **Lorenzo L. True,** secretary and treasurer; and **John K. Dompier,** sales manager.

° ° °

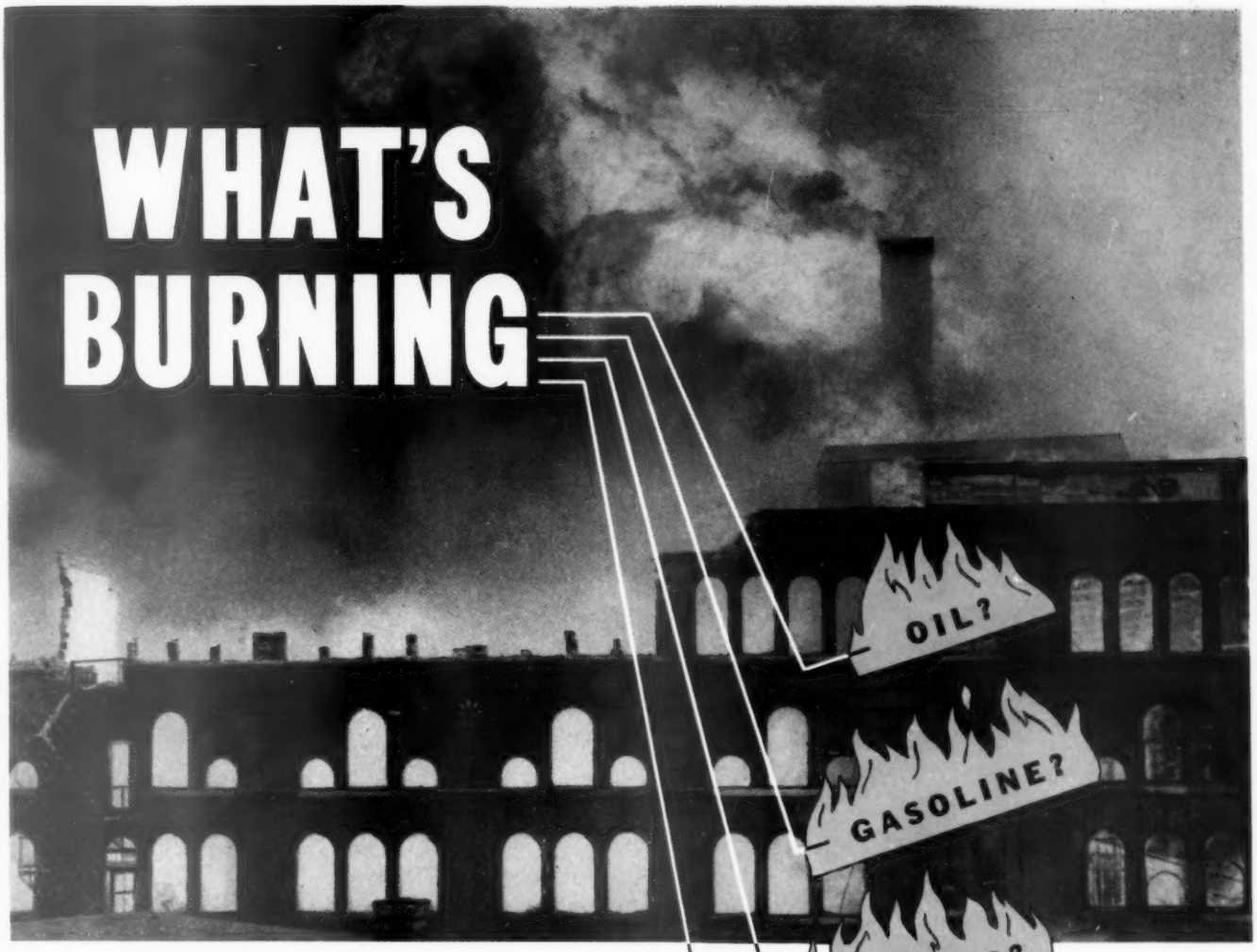
PAW's Distribution and Marketing Division gave a luncheon April 26 for **Wallace E. Avery,** handling marketing matters in PAW's legal division, who left the oil agency April 28 to join the legal department of The Texas Co. in Los Angeles.

° ° °

L. A. Mekler has assumed a new position as engineering consultant to the Institute of Gas Technology and the Armour Research Foundation of Illinois Institute of Technology.

Mr. Mekler joined the Universal Oil Products Co. in 1919 as a designer of heaters and process equipment. From 1921 to 1927, when he returned to Universal, he maintained his own consulting engineering offices in Chicago and in Newark, N. J.

He served with PAW from April 1942 to November 1943 and was in charge of requirements for petroleum refining equipment supplied to Russia.



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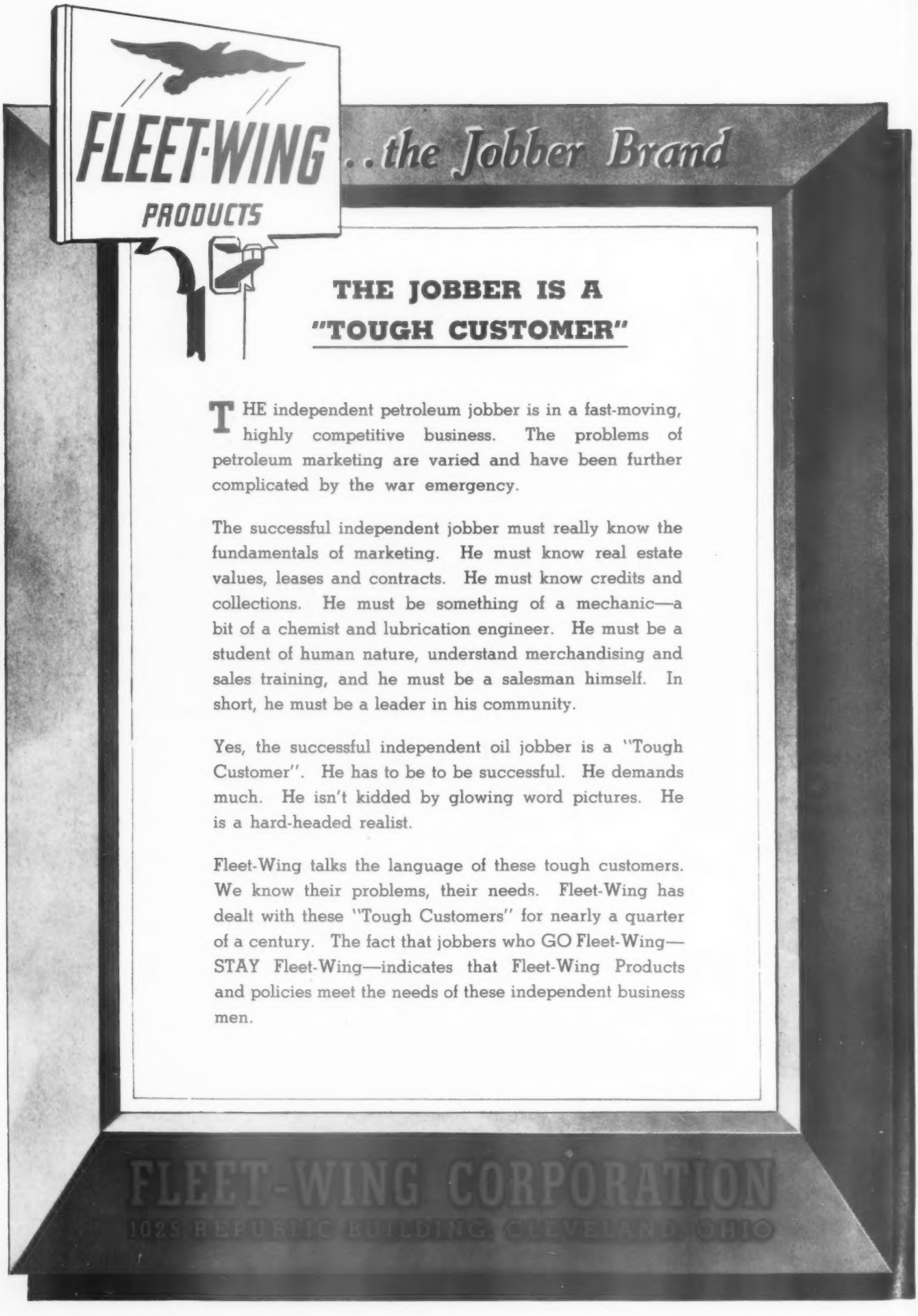
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NATIONAL PETROLEUM NEWS

Monthly Technical Section Devoted to

REFINERY MANAGEMENT *and* **PETROLEUM CHEMICAL TECHNOLOGY**

Section Two **May 2, 1945—Vol. 37, No. 18**

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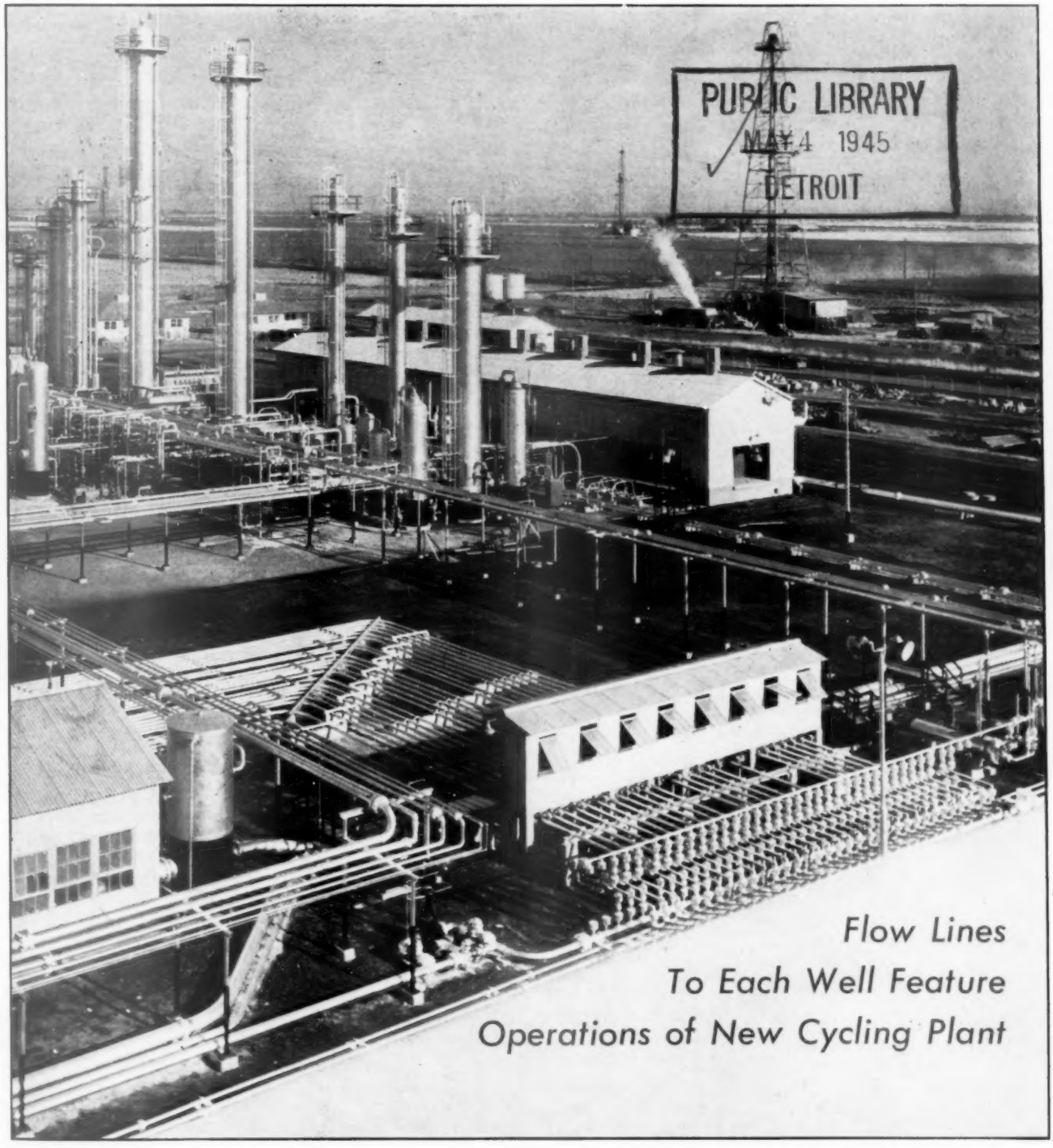
DETROIT



Flow Lines To Each Well Feature Operations of New Cycling Plant

At the Paloma cycling plant in southern California, separate lines run to each individual gas injection well and from each individual producing well. The central control station for all of these lines is shown in the foreground above; fractionating columns and compressor house are in background. For details see "Paloma Cycling Plant Repressures 23 Wells," pg. R-337

The above pictured Hudson induced draft cooling tower, designed to cool approximately 30 million gallons of water per day under adverse Gulf Coast atmospheric conditions, is installed in the Great Southern Corporation Aviation Gasoline plant on Corpus Christi Bay.

The distinctive Hudson quality features in design and construction which resulted in the selection of a Hudson Tower for this installation, assure long, low cost, trouble-free operation.

HUDSON ENGINEERING CORPORATION

Fairview Station, Houston, Texas

HUDSON COOLING TOWERS

MECHANICAL AND NATURAL DRAFT

Contents

National Petroleum News, TECHNICAL SECTION

May 2, 1945—Vol. 37, No. 18

Features

Greater Light-Ends Recovery is Design Trend In Future Natural Gasoline Plant Construction R-323
By V. V. Jaconomini

Mechanical Operation of HF Alkylation Units R-326
By R. A. Findlay

Design and Operating Features of Houdry Units R-333
By R. H. Newton and H. G. Shimp

Paloma Cycling Plant Repressures 23 Wells at 10,000-11,000 Feet . R-337
By E. W. McAllister

Possibilities of Gasoline Engine Development R-346
By Forest S. Baster

War's End Will Not Terminate Shortage of Scientific Manpower for Oil Companies R-367
By D. P. Thornton, Jr.

Petroleum Technologists in the Armed Forces R-370

Evaporation Losses of Aviation Gasoline in Standing Storage Part 2—Tests with Blending Stocks R-373
By Peter Grandone

Engine Oil Foaming R-379
By H. A. Ambrose and C. E. Trautman

Increasing Propane Recovery in Existing Natural Gasoline Absorption Plants R-389
By F. W. Bell

Better Plant Performance Is Goal Of Refinery Technical Division . R-393

Dual-Fuel Diesel Engines Use Eiher Gas or Oil R-396

Departments

Industrial Lubrication R-329
1—Lubrication of Steam Engine Cylinders
By W. G. Forbes

Keeping Up With the News R-363

New Books For the Refiner R-384

Technical Meetings for Oil Men R-388

Advertisers' Index R-399

Widening Horizons R-400
"Wartime Design Features For Normal Practice"
"Guidance on the Research Problem"

Published Every Month by
The National Petroleum Publishing Company
Publication Office, 1213 West Third Street, Cleveland 13, Ohio, U. S. A.
V. B. Guthrie, Editor, Technical Section
D. P. Thornton, Jr., Assistant Editor • William F. Bland, Engineering Editor

PREVIEW

Feature Articles Coming Next Month

• • •

3rd Article on Design Features Of "Cat Cracking" Processes

A description of unique engineering features worked out in the latest commercial applications of the Thermofor catalytic cracking process, in the June 6th issue, will complete the presentation in NPN's Technical Section of this subject for the three principal catalytic cracking processes. Earlier discussions on these processes were mostly limited to their refining aspects.

Improvements in the design of the Fluid process for catalytic cracking were described in the March 7th Technical Section (pg. R-194). Design and operating features of the Houdry catalytic cracking units are described in an article in this current issue (pg. R-333)

The Chemical Utilization Of Natural Gas Postwar

A realistic and scientific approach to the subject of the utilization of natural gas as a chemical raw material, largely based on wartime experiences.

Non-fuel uses for the production of carbon black, synthetic ammonia, aviation gasoline and synthetic rubber are reviewed. Other non-fuel uses which may become more important in the future are described as the manufacture of chemical products for solvents and for the production of plastics, synthetic fibers, coating materials, among others.

Control of Manufacturing And Handling Losses

In the complex refining operations of today a simple balance between quantity of crude run and quantity of products is no longer indicative of real plant loss.

The modern method of procedure for loss control as developed by a large oil company is described in an exclusive article in the June 6th Technical Section. It includes a method for the accurate determination of the total loss, the isolation of all loss sources and development of means to reduce or eliminate entirely the losses, and the application of a system to control the losses within reasonable limits.

Postponed Till June

Because of delays in obtaining clearance on the copy, the story describing the completely new and integrated lube oil plant at one of Canada's largest refineries (originally scheduled to appear in this issue) has been postponed. The article, complete with flow diagrams, will appear in the June issue.

who was

WHO WAS the bus rider who pushed the total number of passengers carried by America's buses since Pearl Harbor over the twenty-eight-billion mark?

Was it a war worker on the way to make guns, tanks or airplanes? A serviceman headed homeward on his last furlough before shipping out? A nurse going on duty at a hospital?

It might have been any of these —or any one of millions of other Americans who rely on buses for transportation, day and night, rain or shine. The bus industry is to be congratulated on its record in this war. Despite the limitations on skilled manpower, spare parts and new equipment, it is today carrying more than double the number of passengers it did in 1940 . . . and the country owes a debt of gratitude to the men of the bus industry for the job they have done.

The war has brought home how important a part gasoline plays in the transportation system of this nation. We, of Ethyl, are glad to have been able to contribute to the improvement of engines and fuels and look forward to continuing co-operation with both manufacturers and operators in the future.

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REFINERY MANAGEMENT *and*
PETROLEUM CHEMICAL TECHNOLOGY

May 2, 1945
Volume 37
Number 18

MONTHLY TECHNICAL SECTION OF NATIONAL PETROLEUM NEWS *incorporating International Petroleum Technology*

Greater Light-Ends Recovery Is Design Trend In Natural Gasoline Plant Construction

By V. V. Jacomini

THE emphasis in design of natural gasoline plants is tending more and more strongly toward greater recovery of butanes, propane and even ethane in grades of higher purity. This requires higher absorption pressures, greater oil circulation, increased fractionating facilities and more diversified storage, all of which tend to increase the investment in this type of plant.

Allied with this trend is that of pressure maintenance, which is of increasing importance as a means both to increase the recovery of oil and to store the dry gas (methane and ethane) against future needs and more equitable prices. Where formerly natural gasoline plants were installed merely for the recovery of natural gasoline and under which conditions they had to bear the entire cost, we now find that most of the new plants are being installed as an integral part of pressure maintenance projects and the costs are therefore more widely distributed, especially the cost of compressing the gas. Since pressure maintenance usually requires high pressures, often in the range of 2000 - 4000 psig, the higher absorption pressures are available.

As an illustration of this trend, prior to the present war natural gasoline plants were operated at low absorption presures (up to about 150 psig), the operating pressures being determined by an economic study of the cost of compressing the gas as compared to the cost of circulating absorption oil. Recoveries then were more or less pegged at approximately 50% in terms of butanes, controlled by the primary consideration of recovering all of the pentanes and heavier. Today, absorber operating pressures of 300 - 800 psig are being adopted and recoveries are now being expressed in terms of 50 - 80% of propane, controlled by the primary consideration of recovering 90 - 100% of the butanes.

The increasing call for liquefied petroleum gases to meet war needs and the necessity of conserving natural resources by pressure maintenance projects has had considerable effect on the design of natural gasoline plants. In this article, the author discusses changes in design and engineering features of natural gasoline and cycling plants brought about by the war and forecasts the future trend in plant construction.

The trend toward higher recoveries of the lighter products applies also to cycling plants. However, unlike natural gasoline plants, these higher recoveries have not affected the absorber pressures since they are normally in excess of 1200 psig and because these operating pressures are controlled by the cost of compressing the gas for reinjection into the reservoir, not by the higher recovery of light products. These higher recoveries, while not affecting the absorber pressure, do mean greater oil circulation, increased fractionating facilities and more diversified storage, the same as for natural gasoline plants.

The military demand for high octane aviation gasoline naturally has greatly accelerated the trend to higher recoveries and we must therefore look to some readjustment in the postwar period immediately following conclusion of hostilities. However, it is not expected that following this period of readjustment there will be any great surplus of light ends. Although the refiner with his enormous expansion of catalytic cracking will produce and recover large quantities of light ends, we may expect the compensating factor that he will be operating for the production of motor gasolines of from 8 - 13 lb. vapor pressure—which gasolines will require large quantities of butanes as compared to the wartime operation for the production of low vapor pressure, substantially butane-free aviation gasoline. It is true that the refiner now consumes large quantities of butanes in the manufacture of aviation gasoline by first processing these butanes in isomerization and alkylation plants. It seems equally true that wartime experience will result in lower operating costs for these processes, thus making possible, in many cases, the postwar operation of these plants with their products going into high quality motor fuel instead of aviation fuel.

Another factor in favor of a good postwar market for these light ends is the expected rapid expansion of the now restricted liquefied petroleum gas market. In this market the war has brought about a definite trend toward higher pressure storage for the reason that the butanes formerly used now are going to the refiner for further processing into ingredients for aviation gasoline, thus leaving for the LPG market only propane,which requires storage facilities for pressures up to 250 psig. With the installation of high pressure storage, as the materials become available, it can be expected that many users will continue to purchase propane, thus leaving the butanes for the refiner who, as pointed out above, will have the equipment available for processing them for ultimate use in high quality motor gasoline.

Last, but perhaps not least in the long run, will be the ever increasing demand by the chemical industry for ethane, propane and, in some cases, butane as raw products for the manufacture of a varied list of products. Already the construction of large plants on the Gulf Coast has materially increased, in that area, the demand for ethane, propane and butanes. With the recent announcement of other chemical plants proposed for this area, it is expected that the chemical industry will become an important factor in the postwar market.

Increased Absorption Capacity

This trend has forced an increase in absorption capacity. In the cases of the older plants this increase in capacity is being attained by an increase in lean oil circulation, by higher absorption pressures, by refrigeration, or by a combination of these, any of which usually requires major alterations to an existing plant. Each plant will present its own problems and no general rule as to how

This article has been prepared exclusively for the TECHNICAL SECTION of National Petroleum News by V. V. Jacomini, design engineer for the Hudson Engineering Corp., Houston. Mr. Jacomini has been engaged extensively in wartime design and construction of natural gasoline and cycling plants.

this increased capacity is acquired can be laid down. For instance, in one Gulf Coast cycling plant, to meet a market demand for 3500 b/d of butanes and propane, the added capacity is being provided by increased oil circulation, requiring additions to the absorbers, heat exchangers, condensers and still, together with a complete revamping of the pumping and piping facilities.

Regardless of how this increased capacity is brought about, it brings with it another problem, namely that of recovering as a liquid product the propane and heavier constituents thus absorbed. Here we encounter the problem of eliminating methane from the rich oil ahead of the still. Formerly it was sufficient to flash the rich oil at reduced pressure and to reabsorb the butanes from the flashed vapors, which could be accomplished without extreme reductions in the pressures on the rich oil. However, with high propane recovery it is necessary to further reduce the methane content of the rich oil which, if flashing of the rich oil is used, means lower flash pressures and greater oil circulations for the recovery of propane from the flash vapors. Because of the excessive quantities of absorption oil thus required, the industry has been forced to develop new methods of reducing the methane content of the rich oil.

At present most operators are installing or are considering the installation of some kind of rich oil demethanization. Straight fractionation of the rich oil for the separation of methane is not economically sound so a compromise system has been developed. This consists of stripping methane from the rich oil in fractionators, followed by the reabsorption of the propane and heavier constituents from the stripped vapors. Demethanization of this type can be operated at pressures up to about 200 psig and bottom temperatures up to about 400° F.

Fractionation

With the advent of these high recoveries of light ends and the market requirements for pure products, considerable revamping of the fractionating equipment has been necessary in those plants converting to these products. Formerly the product fractionating equipment of a natural gasoline plant usually consisted of a stabilizer for the manufacture of 14-26 lb. vapor pressure natural gasoline, followed by a smaller fractionating column for the manufacture of liquefied petroleum gas of vapor pressures up to 100 lbs. As compared to this simple fractionation, a plant to manufacture products for the present day market must be equipped with a de-ethanizer, depropanizer, debutanizer and a butane splitter; in some cases a deisopentanizer and a product fractionator also are required.

For natural gasoline plants the sequence of fractionation generally used is de-ethanization, depropanization and debutanization, followed by the splitting of the butanes into an overhead product of isobutane and a bottom product of normal butane. For cycling plants this sequence has been modified. The raw product is first debutanized, after which it passes to a distillate fractionator where it is separated into aviation gasoline or base stock for motor gasoline, naphthas, kerosene, mineral seal oil and residuum. The totally condensed overhead from the debutanizer passes to a depropanizer, the bottom product of which passes to the butane splitter for production of isobutane and normal butane. The totally condensed overhead from the depropanizer passes to the de-ethanizer, the bottom product of which is liquid propane and the overhead a gas consisting mainly of ethane with some propane and methane.

The requirement of 95% purity for these light products has forced the operator to provide elaborate controls capable of operation on single component products. Where formerly fractionators (stabilizers) of 20 to 30 trays were satisfactory, we now encounter fractionators of from 30 trays for de-ethanization up to 70 trays for butane splitting.

Storage

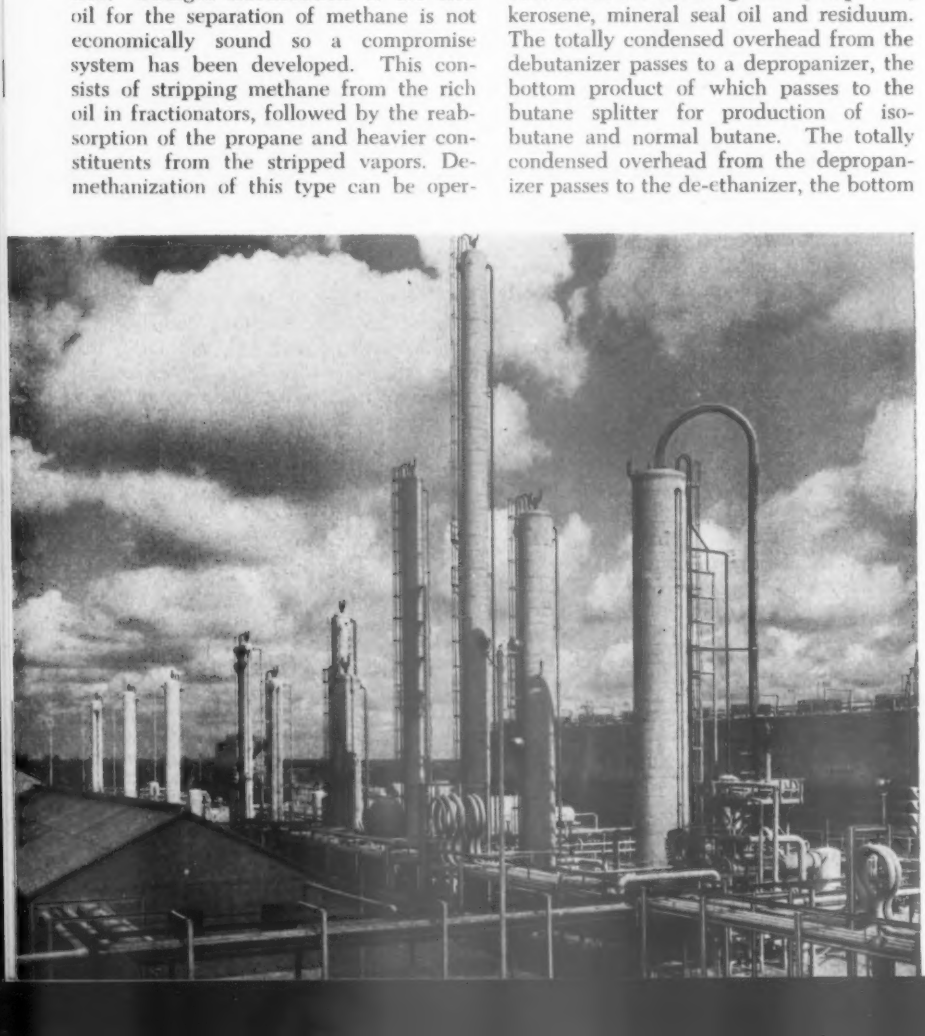
A direct result of manufacturing a number of different pure products is the necessity for a much greater variety of pressure storage than formerly was required. Unfortunately, this increased storage cannot be had at any light cost. With the advent of higher pressure storage, up to 250 psi for propane, the question of insulated and refrigerated storage has come to the front. However, while it might be argued that refrigerated storage results in lower steel requirement, justified from the war viewpoint, investigations indicate that the steel savings are more than balanced by the cost of insulation plus amortization and operating costs of required refrigeration. Therefore it is not expected that refrigerated storage will be used except for those products which deteriorate when stored at atmospheric temperatures.

At present, the storing of ethane or ethane-propane mixtures in the liquid phase does not appear economically sound. In the few cases in which ethane propane mixtures are sold, they are being sold as a gas rather than as a liquid. However, in one case involving a liquid mixture of ethane, propane and butane, the propane-butane part of the mixture is stored as such and the ethane is delivered in controlled quantity to this mixture in a small blending tank at the pump suction. When excess ethane is produced it passes direct from the de-ethanizer accumulator to the fuel gas line and therefore the highest pressure storage required is that for propane.

War Time Construction

Contrary to common belief, plants whose capacities have been increased or new ones built during war time to supply "war products" have not suffered product-wise for lack of materials or through use of substitutes. The Natural Gas and Natural Gasoline Division of PAW, headed by James L. Pew, has done an excellent job of recognizing what is needed and seeing that it was provided.

Fortunately there are very few natural gasoline plants processing corrosive gases



La Gloria Corporation's cycling plant at Falfurrias, Texas. This plant now is being remodeled to supply several thousand barrels daily of butane and propane to a chemical plant on the Gulf Coast

and process temperatures are not sufficiently elevated to require alloy steel. As a result, most W.P.B. directives on use of critical materials have not greatly affected gasoline plant modernization or new construction where the work was authorized as a war measure. Probably the outstanding exception to this general statement has been the shortage of copper. In some cases this has influenced process engineers to design plants for steam rather than electric operation.

In general it has not been necessary to use secondhand material in the construction of war-necessary plants; however, it has been necessary in many cases to make concessions in design so as to conserve critical materials. Notable among these concessions is the reduction to the minimum of ladders and platforms and the substitution of corrugated asbestos-covered wooden frame buildings for galvanized iron-covered steel frame buildings. Priority assistance has been sufficient to obtain major items of new stock. The adoption of the commendable policy which made all this possible indicates that those in responsible positions realized that plants using second-hand material would not give the performance nor could they be placed in full operation as easily and quickly as those plants constructed of all new equipment.

Future Trends — Conclusions

Forecasting the future trends in natural gasoline plant construction is a difficult problem at best. However, in the light of present day requirements a few sign posts may be discerned with reasonable clarity. Markets for relatively pure components undoubtedly will increase and, conversely, it is expected that the market for wide cuts containing a relatively large number of light components will decrease.

The natural gasoline plant of the future will be called upon to supply what will amount to chemically pure grades of propane, butanes and quite probably iso-pentane. If the plant is located in an area where there is reasonable assurance of a long lived production, a ready market from chemical manufacturers for ethane as well may be expected.

Higher absorption pressures will become the rule with the probability in the near future of designing for propane recoveries approaching 100%, with consequent high recoveries of ethane as well. Demethanization of the rich oil will go hand in hand with the higher recoveries of propane.

More plants will be built in connection with pressure maintenance programs, thus permitting the high cost of compressing the gas to be spread over a larger base. It can be expected that legislation will be enacted to require operators to return to the reservoir all gas not being used commercially.

Storage problems will keep pace with the purity of the product and pressure storage capable of handling liquid propane will be installed as a matter of course.

Letters Attest Approval by Technologists In Service of NPN's 'Refresher' Book

EVERY oil refinery technologist who is now or has been discharged from the armed services is entitled to a copy of the "Refresher on Wartime Refining Technology", the review of wartime refining methods and processes recently published by NATIONAL PETROLEUM NEWS.

Copies of the "Refresher" are being distributed, without cost, through the cooperation of the refinery managers of the individual refineries. Each refinery operating head has been sent a complimentary copy of the Refresher and requested to select the veterans or service men now or formerly with his company to whom he wishes to send copies. Letters of appreciation are already coming to NATIONAL PETROLEUM NEWS from men in the service who have received their books.

Any service man or veteran who hasn't yet received his copy of the Refresher is asked to write directly to the editor of the Technical Section of NATIONAL PETROLEUM NEWS, 1213 West Third Street, Cleveland 13. If arrangements have not already been made to send him a copy through his company, one will be mailed from Cleveland.

The Refresher is a 130-page, pocket-size book which reviews the important developments in refining processes, methods, and practices which have taken place during the war. It was written by the staff of NPN's Technical Section for the men who have been away from their companies, to bring them up-to-date on the technological advances in this branch of the industry. To assure completeness and accuracy, the entire text was reviewed by the engineers of several refineries.

While letters are just now beginning to arrive from men in the services to whom copies of the Refresher have been sent, numerous letters have already been received from the refinery heads of the oil companies themselves. Here is what some of them say:

Vice-president in Charge of Manufacturing for a Large Oil Company: "I have scanned your 'Refresher' and it looks like a very good book, with fine coverage of the subjects included. It should be of tremendous interest to anybody connected with the petroleum industry".

British Oil Co. Official: "Permit us to compliment you on the very graceful gesture you have made to those who have given so much for all of us and to whom we cannot help but be eternally grateful."

Vice-President of an Eastern Refining Company: "Thank you very much for affording us this opportunity. We know our technical people in service will find your 'Refresher' helpful and interesting. It is a splendid idea."

Vice-President Oklahoma Refining Company: "I have examined your 'Refresher on Wartime Refining Technology' and want to congratulate you on the preparation of a very fine piece of work. It should very well serve the purpose for which it is intended."

Manager Industrial Relations, Missouri Refinery: "I have read a considerable portion of your 'Refresher' and it seems to me you have hit upon a very worthwhile piece of work. The Appendices in the back and especially the Reading References will interest all refinery employes. You have really furnished them with information that is valuable."

Supt. of Manufacturing, Mid-Continent Refinery: "We wish to compliment you on correlating such basically important wartime developments in refining technology."

Manager of Refining, Western Oil Company: "I am sure that your effort in compiling and making this information available to the technical men in the services will be greatly appreciated by them, as it is in my own case. I am grateful for the copy you sent me."

Personnel Manager, Texas Refinery: "Your 'Refresher' is very interesting and instructive. It is well written and covers the subject nicely."

General Superintendent of Refining, Major Oil Company: "This is a very nice service on your part, as a good many of these men no doubt feel that they are becoming rusty in their profession."

A few comments have also arrived at NPN headquarters from men who have already received their copies of the "Refresher on Wartime Refining Technology":

Army Sergeant in Germany, via V-mail: "We are a mobile petroleum laboratory of six men who were technicians for oil companies in civilian life, who appreciate the effort of the 'News' to make such a book available to us who are now stationed in foreign countries.

Army Lieutenant at Base in Normandy: "This book will be of great help in keeping me informed on the latest developments in the refining industry."

Lieutenant, Army Ordnance Dept.: "We are grateful for your consideration for men in the service. The information in this publication will be of great value in keeping us abreast of trends and developments in the petroleum industry."

Major in Ordnance Dept.: "I have studied the book and will circulate it to the other officers and engineers of this branch. I am sure all will benefit from the material in it."

Army Captain in Belgium; via V-Mail: "Thank you for your consideration for the men in the services."

Mechanical Operation of HF Alkylation Units

By R. A. Findlay

Phillips Petroleum Co., Bartlesville, Okla.

The hydrofluoric acid alkylation plants constructed in the wartime aviation gasoline program and their equipment were designed with extreme attention to the mechanical problems involved in handling HF on a large scale. Design features, which have been justified by the operating and safety records of the plants, have established the main principles to be taken into consideration in the future design and construction of the HF alkylation units. These principles are presented and discussed from the actual operating experience of the units.

THE USE of hydrofluoric acid as a catalyst for the alkylation of olefins with isobutane has been described elsewhere.(1) However, the mechanical features of the commercial scale utilization of this chemical in the petroleum industry are worthy of considerable attention, since the mechanical problems involved in handling HF on a large scale appeared formidable when HF alkylation was first proposed.

Hydrofluoric acid was known to be corrosive toward metals and, in addition, to attack glass and other siliceous materials rapidly. Further difficulties in its use were presented by the fact that it is a volatile liquid, boiling at 67° F., and that it is poisonous. This combination of factors led to a considerable amount of care in design of equipment for hydrofluoric acid service. This careful design has been amply justified by the excellent production and safety record of HF alkylation units.

The first two HF alkylation units in the world were designed and built by Phillips Petroleum Co., the older of the two having now been in operation for more than two years. The fact that both plants have been on stream more than 95% of the time and have been operated well above their design capacity is an indication of the extent to which mechanical problems in handling hydrofluoric acid have been solved.

Safety Considerations in Design

When the first hydrofluoric acid alkylation unit was designed, detailed consideration was given to making it safe to operate. Equipment to handle acid was carefully segregated in concrete basins, all of which drained to a neutralizing pit containing lime water. Individual vessels were well separated from one another to permit free access or egress for operators. Similarly, acid lines were laid at ground level as much as possible, and locations of valves, instruments and pumps were carefully planned to minimize possible hazard. Equipment solely in hydrocarbon service was kept at a distance from the area in which acid was employed.

All these precautions, plus provision of suitable protective clothing, first aid materials, and thorough training of operating personnel, were important in producing the relatively accident-free record which these plants have shown. However, a major factor in the safety of this process was the development of leakproof joints, satisfactory pump and valve packings, and suitable materials of construction; in short, good mechanical design and operation.

Mechanical Operation of Equipment in HF Service

Actual corrosion and metal loss in concentrated hydrofluoric acid has proved on long experience to be very little at ordinary temperatures. By carefully excluding water from the alkylation unit, corrosion can be reduced to a negligible amount. Even at elevated temperatures and in contact with dilute acid (about 30-50% HF), alloys are available to withstand corrosion, under the conditions where such acid occurs, in alkylation.

A considerable body of experience has now been accumulated to guide the designer of equipment for handling HF. Detailed information is available regarding operating experience with various pieces of equipment. In general, there are a few main considerations which should be kept in mind when designing or selecting equipment for hydrofluoric acid service.

(1) **Equipment Involving Close Clearances**—Steels in contact with hydrofluoric acid acquire a tough, tightly adhering scale. This fact must be considered in connection with clearances between the wear rings of pumps, the stem and guides of valves, and the plugs and bodies of plug valves. If steel equipment is used, clearances must be greater than they would normally be in other service. Where wider clearances are impossible, alloys high in nickel, such as Monel, should be used since they show practically no scale forming tendencies.

(2) **Equipment Involving Internal Bolting**—Design of equipment should preferably be such as to avoid necessity for the use of bolts in contact with hydrofluoric acid, since steel bolts are subject to breakage after prolonged contact with hydrofluoric acid. If the use of bolts is unavoidable, K Monel is suggested. The cause of the breakage of steel bolts has not yet been definitely ascertained, although metallurgical investigations are under way to clarify the matter. Breakage of steel parts in plug valves has also been observed.

(3) **Need for HF Resistant Plastic Materials**—Specially designed packing glands should be used on all pumps handling hydrofluoric acid, since a plastic material suitably resistant to both the acid and hydrocarbons has not yet been found. These special packing glands require provision for a hydrocarbon flush. A further development of the need for HF resistant plastic materials is that the ideal plug valve lubricant has not yet been developed.

These are the main design considerations which have arisen as a result of about two years experience in operation of HF alkylation units. One further phenomenon is that of blistering of steel. After more than a year's contact with concentrated hydrofluoric acid-hydrocarbon mixtures, steel in some cases develops blisters varying from ⅛ to ¾ in. diameter and from 0.03 to 0.04 in. deep. These blisters contain a gas, presumably hydrogen, under high pressure.

This development is not yet considered a design problem since blisters have been found mainly on inner partitions of vessels. Very few have appeared on vessel walls where they might cause concern regarding vessel failures. There are some indications that blistering may be confined to poorer quality steel with dirt inclusions.

Operation of Pumps

In general, centrifugal pumps have proven capable of handling concentrated hydrofluoric acid satisfactorily. If multistage pumps are used with steel wear rings or stage pieces, the clearance between the wear rings is of considerable importance. Close clearances have been found to result in sticking of the pump as a consequence of scale formation as noted above. Clearances in the range 0.020 to 0.040 in. have given satisfactory operation.

The other problem of pump operation, that of packing, is considered to have been completely solved. A special packing gland is used (see Fig. 1) in which a hydrocarbon flush stream may be introduced just

(1) F. E. Frey, Chem. & Met., p. 126, November, 1943.

outboard from the throat bushing. The pressure of this flush stream is maintained about 15-25 psi above the pump case pressure. Thus the packing gland contains only hydrocarbon and no acid; some hydrocarbon, of course, leaks through the throat bushing into the pump. The problem is reduced to the more familiar one of packing against hydrocarbons.

The hydrocarbon stream chosen for flush material is decided mainly by convenience. In the alkylation section, isobutane is frequently used since it is suitable from a process point of view, while in the acid rerunning step some other stream, such as heavy alkylate, may prove more suitable.

In case a light hydrocarbon is used as flush it is also necessary to provide lubrication to the packing, to counteract the washing of lubricant out of the packing.

One further operating problem in the case of certain pump designs is that of internal bolting. Pumps of the vertical deep-well type, where the stages are fastened together with nuts and studs, have failed by shearing of the studs after prolonged contact with hydrofluoric acid. A picture of a typical case is given in Fig. 2. In this case the pump had been in operation about six months and 84 of the 104 studs were broken. This type of failure is probably similar to breakage of plugs, cover plate studs, etc. in plug valves, and to failure of bolts in Stratco contactors.

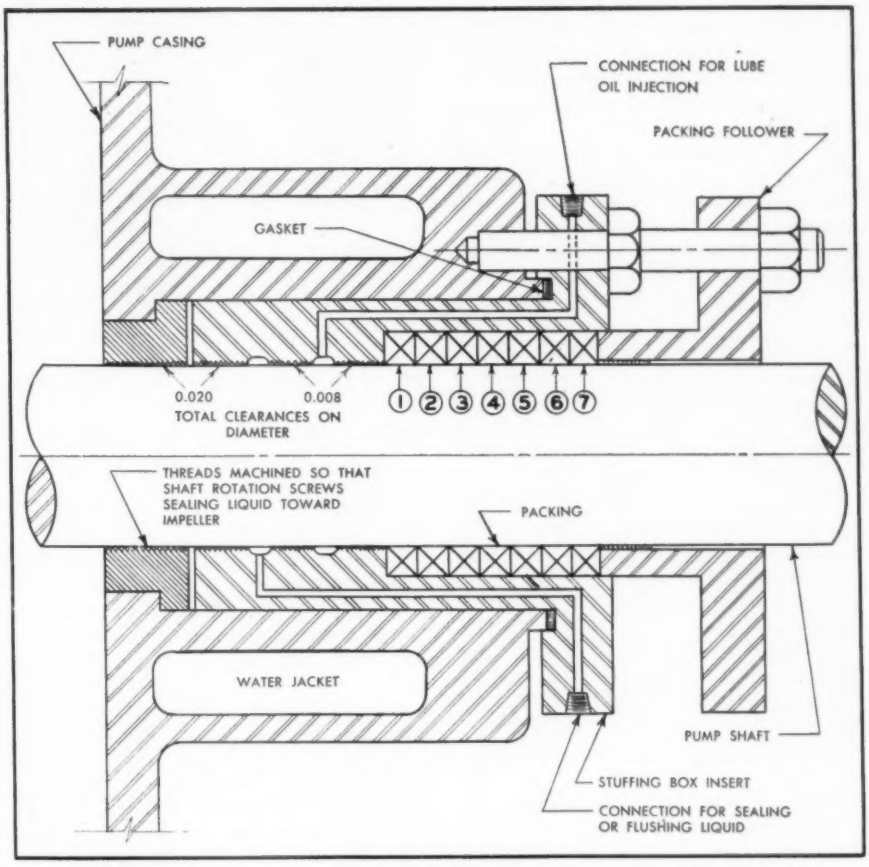


Fig. 1—Stuffing box arrangement for pumps handling hydrofluoric acid

Operation of Reactors

Reactors presently used in Phillips HF alkylation plants are "Stratco" contactors provided with a double Duraseal gland on the impeller shaft. This double Duraseal has been supplemented by use of a hydrocarbon flush above the top seal for the purpose of keeping hydrofluoric acid out of the gland. The most satisfactory seal rings for use in these Duraseals are of Stellite on the rotating ring against either Colmonoy or lead bronze on the stationary ring.

The materials of construction used in these reactors have proved eminently satisfactory after more than two years' operation. Inspection of two reactors after 17 months use showed no pitting on either the impellers or the vessels themselves. The inside surfaces of the inner concentric shells were covered with blisters as described previously. In one isolated case a blister 2.75 in. in diameter was observed, the cavity in this case being 0.25 in. deep. The outer reactor shell, however, was free from both blisters and pitting. Bolts holding the inner concentric shell to spacer plates were broken but not corroded. Some difficulty with sticking of impellers has been experienced after inspection periods because of scale which settles in the bottom of the contactors. However, if this scale is cleaned out no further difficulty occurs.

Operation of the Duraseals on these reactors has been singularly trouble-free. One assembly was in operation for over 17 months continuously until shut-down for inspection. The advantage of using a hydrocarbon flush above the top seal is amply demonstrated by the absence of fluoride scale on the shaft below this seal ring and of attack on the neoprene packing, even after occasional failures of lubricating oil supply to the seals. Lengthy experience has shown that wear of these seal faces is very slight. After 17 months' operation, upper seal faces of Colmonoy and Stellite were found to be only slightly grooved. There were about four circular grooves 0.003 in. deep in both surfaces but these had not affected the satisfactory operation of the seal. Lower seal faces of Stellite and lead bronze showed no grooves, and still had a high polish.

This picture of satisfactory, trouble-free operation should be tempered with a note of caution. Design, installation, and operation of these Duraseals requires considerable care. Faces must be aligned carefully in situ, and lubricating oil and flush stream pressure must be controlled and constant.

A good example of the critical nature of the smallest details of this assembly is the performance of sets of seal rings with narrower faces than previous sets used.

These assemblies were installed in the three reactors of one unit early in 1944. The upper, stationary seal ring was of lead bronze but had a face 3/16 in. wide compared to 13/32 in. on previously used rings. Heavier duty springs were substituted for the original one. These Duraseals operated satisfactorily for six months until an inspection period. The Duraseals were not inspected but on starting the unit again, the seals were found to be leaking badly. A groove 0.015 in.

Fig. 2—Vertical pump with broken bolts

deep had been worn in the Stellite face. This is to be compared with operation of 17 months or more with virtually no wear using Colmonoy or lead bronze rings of the original design.

In the assembling of the particular Duraseal described above, the extreme care and accuracy required was well demonstrated. The lead bronze upper ring arrived from the manufacturer already installed in its steel mounting ring and faced true. However, the assembly on the job required that this steel mounting ring be pressed into the top of the "bell housing". Since this required a fair amount of force it was decided to check the surface after it was assembled in place. It was found that the surface of the lead bronze ring was no longer giving complete face-to-face contact with the Stellited rotary ring, there being two high and two low spots. Deviation from a plane surface was 0.0015 in. It was necessary to face the wearing surfaces in place.

Maintenance of a continuous flow of hydrocarbon flush under all conditions is obviously important but it is also important to control the flush pressure so that it is always below the lubricating oil pressure. If the flush pressure rises above the oil pressure, the rotary seal ring will be forced down away from the stationary ring. For the protection of the accurately-machined wearing faces, the flush stream must also be completely free of abrasive material.

Provided that care is taken in the design, installation and operation of Duraseals, they will give trouble-free operation in hydrofluoric acid service.

Operation of Plug Valves

Because of the close clearances required in plug valves, the use of coated plugs and bodies is necessary for hydrofluoric acid service. The combination of Stellited plugs and Monel-coated bodies has so far given fairly satisfactory service, although experience with specially-coated valves is still somewhat limited. Because of high cost of these special plug valves, designers should use gate and globe valves wherever positive closure is not essential.

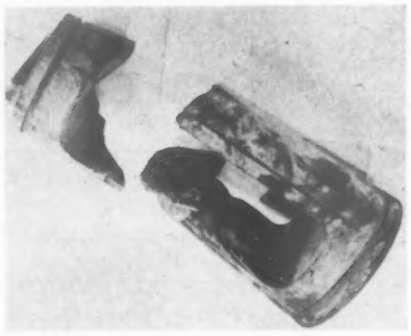


Fig. 4 (above)—Broken plug from Hyperseal valve

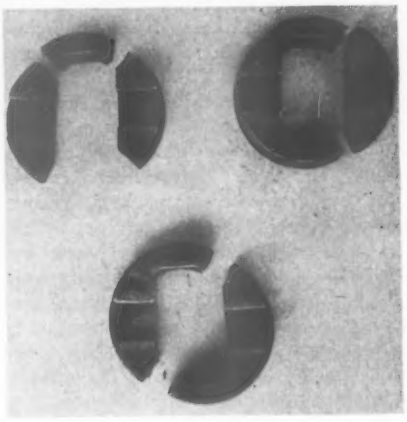


Fig. 5 (right)—Broken equalizer rings from plug valves

Ordinary steel plug valves have not proven satisfactory for hydrofluoric acid service. Scale formation takes place on the plug and seat resulting in sticking of the valve (see Fig. 3). This tendency toward sticking is aggravated by the necessity of using highly viscous valve lubricants, the only lubricants which have been at all satisfactory. In numerous cases plug valves are found to suffer from incomplete lubrication, grease having failed to travel the full length of the port. In some cases this may be ascribed to plugging of the ports with scale. The breakage of steel bolts and other small steel parts has also been encountered in plug valve operation.

(1) **Cracking of the Plug**—Cases of cracked, splintered and broken plugs have been found after exposure to acid (see Fig. 4). It is possible that this situation is aggravated by the deep hardening steel of which these plugs are made, the surface of the plug often showing numerous microscopic cracks. No case of breakage of a Stellited plug has been encountered.

(2) **Cover Plate Stud Breakage**—Failure of bolting at the cover plate has been observed, principally during attempts to free stuck plugs using an air-pressure grease gun. Increased bolt strength has been recommended to overcome this difficulty.

(3 **Equalizer Ring Failure**—Failures at this point have also taken place (see Fig. 5).

(4) **Inner Diaphragm Failure** — This type of failure is not very common but use of Monel diaphragms instead of stainless steel is recommended.

The approximate frequency of these various difficulties with ordinary steel plug valves is given in Table I, compiled from data accumulated at inspection periods of two Phillips units. Only a small percentage of valves actually have broken parts but the proportion is sufficiently high to justify the use of coated valves.

TABLE 1

Frequency of Steel Plug Valve Failures
(Expressed in percent of the total valves in acid service)

Size of Valve in.	Stuck[1] Valves %	Broken Plugs %	Broken Equalizer Rings %	Broken Diaphragms %
2	13	0		
4	26	0–6	0	8
6	23	8–13	7	2
8	20	13	0	6

[1] This column includes valves which were stuck but had no broken parts.

Sticking of the plug is the primary problem in the use of ordinary steel valves, particularly since attempts to free a stuck plug using long handled wrenches or high pressure from a grease gun undoubtedly contribute to the number of broken parts. However there is also a real metallurgical aspect involved in these breakages since they are not entirely due to the use of excessive force.

The added operating cost resulting from sticking of ordinary steel plug valves is further justification for the installation of coated valves. The full time work of from one to three men has been found necessary in servicing these valves depending on the number of valves in use. In order to keep ordinary steel valves in an operable condition it is necessary to grease and move each valve regularly every day or two.

In designing equipment for hydro-

(*Continued on p. R-386*)

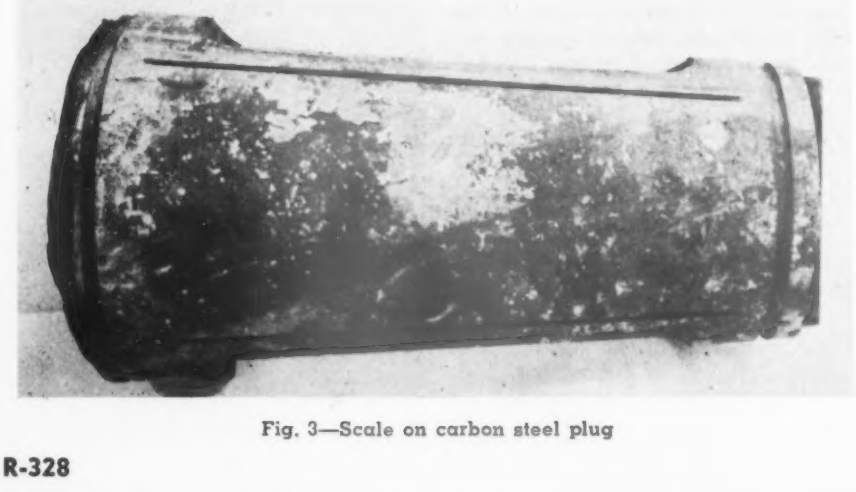


Fig. 3—Scale on carbon steel plug

INDUSTRIAL LUBRICATION

By W. G. Forbes

1—Lubrication of Steam Engine Cylinders

To keep abreast of technological developments in the field of industrial lubricants and industrial lubrication, which usually are given little attention in current literature, NPN's Technical Section is introducing a regular feature devoted to this subject.

It will be conducted by W. G. Forbes, well known authority in this field and author of the widely accepted text books, "Lubrication of Industrial and Marine Machinery" and "Lubricants and Cutting Oils for Machine Tools".

This feature will be presented in the form of questions and answers on various specific topics in industrial lubrication, including the application of mineral oils to industrial process work. Opinions stated will be expressly those of the author. Comment and questions from readers are also invited by Mr. Forbes, who states that, if he cannot answer them himself, he will endeavor to find someone who can.

Mr. Forbes was born in Scotland and served as an apprentice in the engine and turbine shops of a shipbuilding yard on the Clyde. He came to this country from England in 1925 and has spent the past 15 years in the oil industry as a lubrication engineer. He is active in several scientific societies and has had many articles published on various engineering topics. At present he is Lubricating Engineer for the Tide Water Associated Oil Co., New York.

W. G. Forbes

Q—What is the difference between a filtered cylinder oil and an unfiltered cylinder oil?

A—The best grades of steam cylinder oil are secured from paraffin base crudes, of which Pennsylvania and Mid-Continent crudes are examples. When all other products such as gasoline, kerosine, fuel oil, and light lubricating oils have been distilled off by means of heat, there remains a product at the bottom of the still which refuses to boil and distill off, unless destructive temperatures are employed. This material is known as "cylinder stock". It is drawn off and may be used for blending with lighter oils, or it may be used as a heavy gear lubricant, or it may be used for lubricating the valves and cylinders of steam engines.

The majority of steam cylinder oils require very little treatment before they are ready for commercial use, and for the majority of applications they are often used without dewaxing or elaborate refining, other than that of removing any asphalt or similar unwanted material that may be present, generally in small quantity. These are unfiltered cylinder oils.

If it is desired to remove some of the carbon residue material, make the oil separate faster from water, and lighten the color, the cylinder stock is diluted with a solvent and allowed to percolate through a thick bed of clay and filtering material such as fullers earth.

Upon completion of this filtering process, the solvent is driven off by means of heat, and the cylinder stock is then termed a filtered cylinder oil. Another trade name is "bright stock" and the degree of filtration is commonly designated by a color test while taking into consideration the original source of the crude.

Q—When are filtered cylinder oils employed to lubricate the valves and cylinders of steam engines?

A—Filtered cylinder oils are generally used when it is necessary that the oil separate readily from water. In many engines the exhaust steam is condensed and the water may be used for process work, or it may be returned to the boilers and, if means for removing the oil are not particularly effective, the filtered cylinder oil will readily float on the surface of the water from whence it may be removed by a suitable weir, by a scoop, or by any of several simple methods.

Owing to the fact that filtered cylinder oils separate readily from water, it is possible to add as much as 3% of tallow oil and still secure good separation from water. This combination improves cylinder lubrication by maintaining a slight emulsion with the moisture present on the cylinder walls. The formation of an emulsion makes the oil film more resistant to being washed off, and, therefore, reduces the number of drops per minute required for adequate lubrication.

Filtered cylinder oils are also used for engines operating on dirty steam. They will generally maintain the internal moving parts in a cleaner state than unfiltered cylinder oils because they have less tendency to combine with the impurities and bake into deposits. For this type of service the oil should contain about 5 or 6% of tallow or lard oil to assure the maintenance of a tenacious emulsion on the cylinder walls.

Q—Why do some filtered cylinder oils contain lard oil rather than tallow oil to secure a tenacious emulsion in the presence of moisture on steam cylinder walls?

A—Highly filtered cylinder oils do not always blend easily with fatty oils. For this reason, tallow oil will not stay in solution in some grades, but lard oil will stay in solution, and produce the desired emulsion.

Q—What type of cylinder oil is generally recommended for steam engines operating on low pressure, wet steam?

A—The term low pressure steam generally refers to pressures below 150 psi and the term wet steam generally refers to steam that contains more than 3% of moisture upon arrival at the engine throttle valve.

For this general operating condition, the most popular grades are unfiltered cylinder oils having a Saybolt vis. of 125 to 155 sec, at 210° F. If separation of the oil from the condensate is not a factor in the operation of the engine, the normal percentage of compound employed is 5 to 6% of tallow oil, but if the steam engine is located at some distance from the boiler, or if it operates for appreciably long periods of time at less than

full load, 8 to 12% of compound may be found advantageous because these conditions promote more moisture in the steam, generally 10% of moisture or more. Hence the extra amount of compound combines with the excess moisture and retains the tacky emulsion on the cylinder walls.

For large horizontal engines, there is a preference for heavier oils, because the weight of the piston falls on the lower half of the cylinder wall, and for such engines the oil may have a Saybolt vis. of about 180 sec. at 210° F. and 5 to 6% of tallow oil. As a rule this heavier type of oil is not used for steam pressures below 100 psi.

Q—What general type of cylinder oil would you recommend for a 250 HP single cylinder, horizontal uniflow engine operating on a steam pressure of 200 psi at the throttle valve? Other conditions are as follows:

The steam contains about 3 to 5% of moisture, and the engine turns 125 RPM. During the summer months the exhaust steam is passed to the atmosphere; during the winter months the exhaust steam is used for heating purposes, and some of the condensed steam is returned to the boilers.

A—An average recommendation for year-round operation would be a cylinder oil having a Saybolt vis. reading of about 170 to 190 sec. at 210° F. and 5 to 6% of tallow oil. An installation of this type is almost invariably equipped with an extractor to remove oil from the exhaust steam. Consequently, when condensed steam is being returned the boilers the extractor will be in operation and no trouble should be experienced in reducing the oil content to a safe limit.

Q—What quantity of oil feed in pints per 8 hours would you consider suitable for the lubrication of the above engine cylinder?

A—An average oil feed rate would be 2 to 3 pints of cylinder oil per 8 hours. The engine would probably have 2 or 3 leads directly piped to the cylinder walls, and one lead directly piped into the steam line. Hence the proportion through each line would have to be suitably divided, with a small proportion going through the lead into the steam line, and the rest to the cylinder walls. In this type of engine, the oil that is fed directly into the steam line keeps the throttle valve working easily, and lubricates the poppet valve stems which admit the high pressure steam to the cylinder.

Q—What is the purpose of an oil atomizer in the steam line?

A—This device is a tube which is placed in the steam supply line and extends half way into the direct path of the steam as it flows to the engine. The tube is generally about 3/8 in. in diameter, and designed like a pen point with a saw cut for a slot. As the oil is delivered from the lubricator, it is forced through the slot by the on rushing steam and thereby atomized. In this form, the oil is swept against the steam admission valves and into the cylinder, where a large percentage lodges on the cylinder walls. For smaller engines of the Corliss and slide valve type this method is highly effective and no other leads are required from the lubricator. However, the atomizer should be located below the throttle valve to avoid any baffling effect. Otherwise, the finely atomized oil will strike the valve and lose much of its effectiveness.

For large engine cylinders it is necessary to divide the total oil feed between the atomizer and two or more leads going directly to the cylinders because the internal cylinder volume is too large to rely entirely on atomized oil for complete lubrication.

When small high speed engines are designed with poppet valves to admit the high pressure steam, the cylinder oil may sometimes be introduced just ahead of the valves but in all cases these points of application should always be checked to see that the cylinder oil is being applied at points where it will be most effective.

When engine cylinders are surrounded by a steam jacket, the main oil supply lines must go directly to the cylinders, because steam jackets baffle and obstruct the passage of atomized oil. However, an atomizer should be placed in the steam line for the purpose of feeding a little oil to preserve the packing in the throttle valve, make it work easier, and at the same time maintain a small supply of oil to the stems of the steam admission valves.

Q—What type of oil would you consider suitable for a steam engine operating under the following conditions? Steam pressure 250 psi at the throttle valve, added superheat 150° F. The engine is designed with poppet valves for steam admission, it has four cylinders, develops 600 HP and turns 450 RPM. At the exhaust end, the steam passes through a centrifugal oil extractor and later returns to the boiler as feed water.

A—In this case the engine particulars are not important because the steam is dry and hot. After leaving the boiler it has a temperature of about 400° F. at 250 lbs. gage pressure, then it passes through superheater tubes located in the path of the boiler flue gases where the temperature is raised another 150° F. Consequently, the total temperature of the steam is 400 + 150 or about 550° F.

In this temperature range, straight mineral cylinder oils are generally preferred, because at these high temperatures tallow or lard oil tends to decompose and accelerate the formation of deposits inside the engine, particularly in and around the exhaust valves. Furthermore, the supply steam contains no moisture to emulsify with a compound. Hence the cylinder oil should be straight mineral and the Saybolt vis. about 225 to 250 sec. at 210° F. which would be considered a heavy bodied type of cylinder oil capable of meeting and countering the thinning effect imposed by the high temperature of the supply steam.

Q—Two cylinder oils have Saybolt viscosities as follows:

Oil A — Vis. at 100° F. is 2300 sec. and at 210° F. is 150 sec.

Oil B — Vis. at 100° F. is 7000 sec. and at 210° F. is 300 sec.

What are the viscosities of these oils at 300° F. and 400° F?

A—Oil A at 300° F. has a vis. of about 60 sec.

Oil B at 300° F. has a vis of about 70 sec.

Oil A at 400° F. has a vis. of about 41 sec.

Oil B at 400° F. has a vis. of about 45 sec.

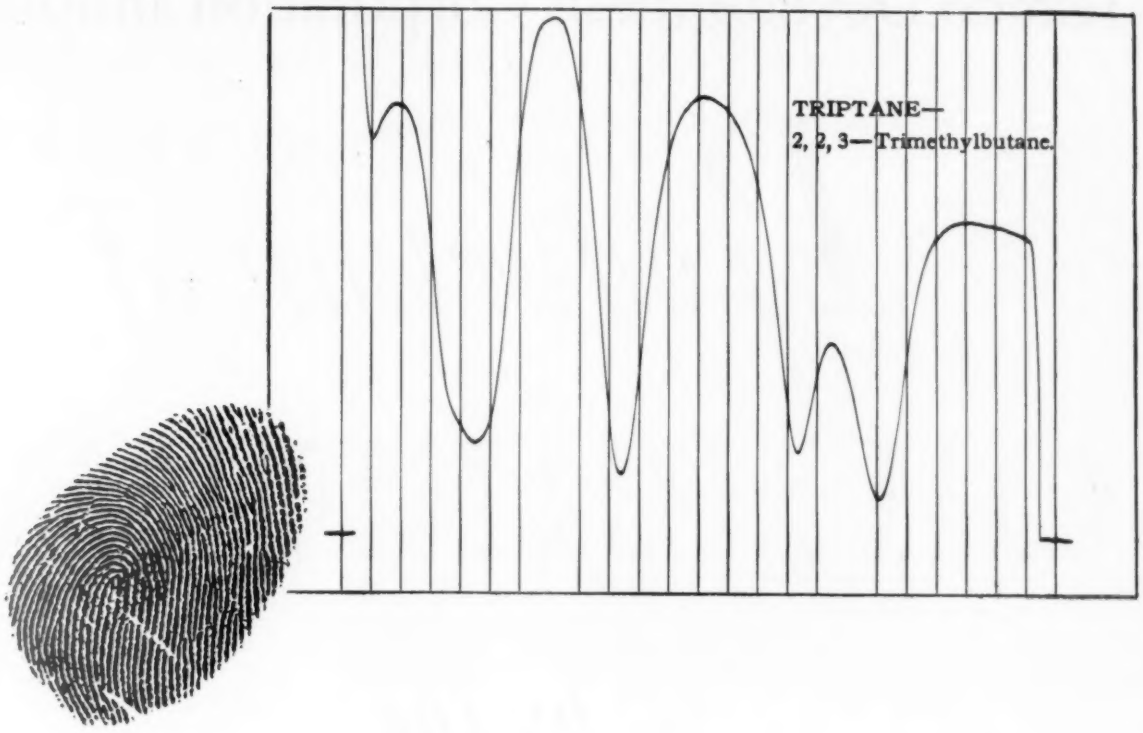
These readings were secured from a viscosity temperature chart by plotting a line and reading off the viscosities at 300° and 400° F. These charts are published by the American Society of Testing Materials. In the above example, the Saybolt vis. of Oil A was only 41 sec. at 400° F., which is not much above the viscosity of No. 2 fuel oil at normal room temperature.

For Oil B the vis. at 400°F. is only 4 sec. more, or 45 sec. This comparison shows that the oil entering a steam cylinder may be thinned down to a point where it is almost as fluid as a light fuel oil at room temperature, particularly if the steam is superheated. The two above oils would thin down a little more at 450° F. but from here on they would not thin down much more. At 550° F. and 625° F. respectively they would commence to crack and distill.

When it is considered that the oil film on a cylinder wall is probably not more than one thousandth of an inch in thickness, and therefore extremely vulnerable to the influence of high temperatures, it is not hard to understand why deposits become troublesome with high temperature steam. This example also demonstrates why an atomizer cannot be used effectively with superheated steam. With this method, the oil becomes overheated before it reaches the cylinder walls, because it is atomized in the path of the hot steam before reaching the steam admission valves and entering the cylinder.

Another factor that enters into the lubrication of steam cylinders operating on high superheat steam is the fact that the oil travels slowly from the lubricator, and upon reaching the point of application it is hot and thin before going into operation. For these reasons, it is impractical to try and operate steam engines with very hot steam, as for example, steam that reaches the throttle

(*Continued on p. R-394*)



FINGER PRINT OF A HYDROCARBON

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The UOP infra-red spectrometer "finger prints" hydrocarbons—a valuable aid to our technologists in analyzing hydrocarbon mixtures.

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CATALYTIC REFORMING
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ALKYLATION
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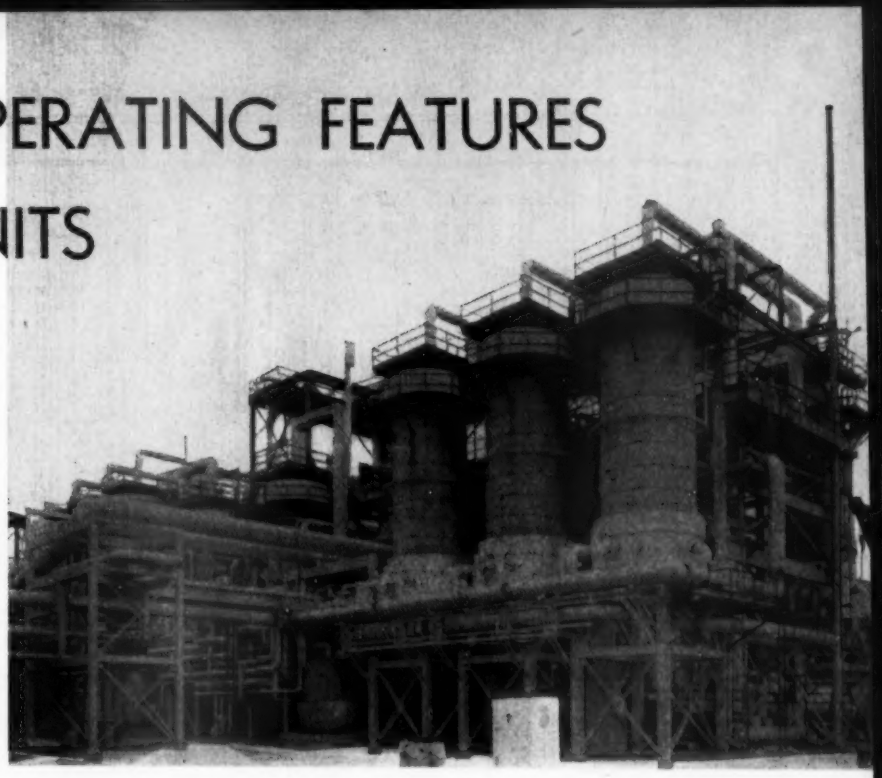
DESIGN and OPERATING FEATURES of HOUDRY UNITS



By
R. H. Newton
and
H. G. Shimp

Distinctive original features of the Houdry catalytic cracking units are described, by means of which automatic control of a cyclic operation over a bed of pellet catalyst is secured. Earlier published data on this process has been principally on its refining aspects.

The design and operating features embodied in present units were based on intensive studies of the relation of carbon deposits on the catalyst to yield of gasoline, varying depths of cracking, space rates and other factors, to insure that commercial designs provided optimum operating conditions. Desired flexibility in operations is secured through multiple cases. An interesting aspect of the Houdry fixed bed units is the application of the gas turbine to power recovery.

THE Houdry fixed bed catalytic cracking process was announced in 1938[1] and since that time several papers[2, 3, 4, 5] have been published on the subject. These papers were concerned primarily with the refining aspects of the process, the economics of catalytic cracking, and the application to various refinery conditions.

The present paper is concerned principally with the distinctive features of design and operation which are novel in their application to petroleum engineering.

In the fixed bed plant, the catalyst in the form of small pellets is contained in specially designed heat transfer vessels or catalyst cases. The several gas streams are passed through each bed in sequence to obtain the steps of cracking, purging, regeneration and purging. The cracking step consists of passing the oil vapor over the clean catalyst, and is followed by the removal of adsorbed oil from the catalyst by purging with steam at low pressure.

The regeneration of the catalyst is accomplished by combustion of the carbonaceous deposit with air and is followed by the removal of air; the cycle is then repeated. By the use of a number of catalyst cases, 3 or 4 or multiples thereof, the flow of all major streams is continuous. These operations comprise the heart of the process. The heating and vaporization of the oil stream and the cooling, fractionation, and condensation of hydrocarbons follow the lines of conventional refinery processes. Fig. 1 represents a simplified flow diagram of a Houdry plant.

Catalytic cracking of petroleum fractions over silica-alumina catalyst is characterized by an endothermic reaction as the larger molecules are cracked, but is also accompanied by a deposition of heavy hydrocarbons on the catalyst, which ultimately build up to sufficient concentration to markedly decrease the rate of cracking. The method employed for regenerating the catalyst is combustion of the carbonaceous deposit, which is of course strongly exothermic. The heat of combustion generally exceeds the heat of cracking; so the entire process is exothermic. The alternate cycles of oil and air require efficient purging to avoid explosive mixtures. As in all catalytic processes, good distribution of the reacting vapors through the catalyst is essential.

Thus the needs of catalytic cracking may be summarized as follows: furnish heat when and where required, remove heat during regeneration, purge catalyst to avoid mixture of air and oil streams, distribute reacting vapors uniformly over catalyst and prevent build-up of excessive catalyst deposit which hinders reaction. In order to achieve all these objectives at the same time, many factors of design were considered.

Cyclic Operation of Plant

Having settled on a fixed bed of catalyst, studies were made of the optimum type of cycle to use. The general picture of yield of gasoline is summarized in Fig. 2, which shows the relationship between the carbon deposit and the gasoline made when other conditions are adjusted to optimum. It is evident from this series of curves that a yield of gasoline obtained at about 4% by weight of carbon deposit is not far from the economic maximum. One other factor not shown is the light gas production. These light gases are of interest only as refinery fuel in most cases and hence are of low value. As the oil is cracked deeper, the losses to coke and to light gas increase much more rapidly than the gasoline increases. Hence for most applications, the catalytic cracking unit should be designed to handle about 4-5% of the charging stock as carbonaceous de-

This article was originally presented before the American Institute of Chemical Engineers semi-annual meeting in St. Louis, Nov. 19-21, 1944, under the title, "The Design and Operating Features of Houdry Fixed Bed Catalytic Cracking Units," and was published in the April 25, 1945, issue of the Transactions of the Institute. *H. G. Shimp is in the research and development dept. of the Houdry Process Corp., while R. H. Newton, formerly associated with the Houdry Process Corp., is now with E. B. Badger and Sons Co.*

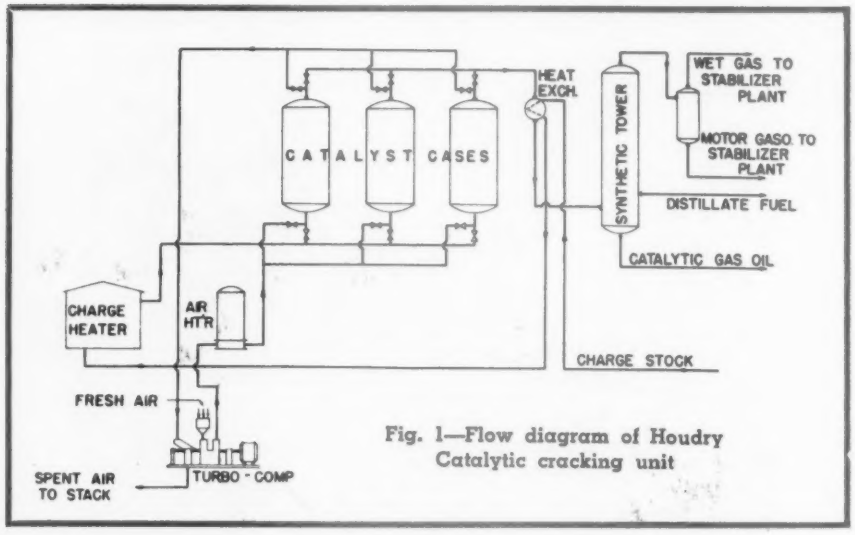


Fig. 1—Flow diagram of Houdry Catalytic cracking unit

posit to be burned from the catalyst.

With low-activity catalysts which were available in the early days of the development, it was difficult to obtain the desired depth of cracking at high space rates. However, by the time the

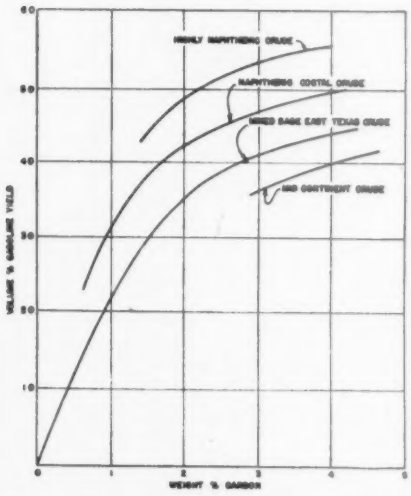


Fig. 2—Relationship between gasoline yield and carbon deposit in Houdry operation

first commercial scale unit was ready to operate, the knowledge of catalyst was sufficiently advanced to permit high activity which would allow conversion of the order given above, at space rates of one liquid volume of oil per volume of catalyst per hour and higher. This resulted in the necessity of burning carbon at the rate of 7.8 lbs. per hour for each 100 lbs. of catalyst on-stream. Obviously the use of multiple catalyst cases allowed considerable flexibility in design, since for each case on-stream one or more could be regenerated. If the condition is set that both oil and regeneration air flow are continuous, then the regeneration time must be an even fraction or multiple of the on-stream time, and a wide variety of cycles can be used.

The nature of the carbonaceous deposit is such that combustion takes place in a very narrow band (about 3 in. in width) and the temperature reached is a function of the carbon present, unless very low air flows are used. This latter case was found not to be interesting since the regeneration period was excessively long. In order to control the maximum burning temperature within the limits which would not damage the catalyst, it was found necessary to limit the amount of carbon on the catalyst and also provide extensive heat transfer surface for removal of heat. This combination with the heat capacity of the catalyst and heat transfer elements worked out to a carbon burning rate of 1.1% by weight of the catalyst in 10 minutes when the initial concentration did not appreciably exceed the 1.1%. If the initial concentration were higher, and the burning allowed to proceed a longer time, excessive temperatures were found. On the other hand, if the initial concentration were lower, insufficient heat was developed (considering the heat removing capacity) to burn off the deposit cleanly; in other words, the fire went out.

A second factor in limiting the deposit on the catalyst was its poisoning effect. The rate of cracking on clean catalyst is very high and drops to practically zero when the catalyst deposit amounts to 13 to 18% by weight. In order to promote a sufficient rate of cracking to attain the desired depth, the maximum deposit was found to be about 1.5%.

Thus the general design condition was set up that at the end of the on-stream period the catalyst would have a carbon deposit of 1.1% by weight or 7 grams/liter of catalyst. Regeneration periods of less than 10 minutes did not appear feasible, and since concentration of carbon was the major factor in the maximum temperature, a longer regeneration time represented a loss in carbon burning capacity.

TABLE 1—Cycle Timer Sequence

Open oil inlet and outlet valve	0 min. 12 sec.
On-steam	10 min. 8 sec.
Close oil valves	0 min. 12 sec.
Check closed	0 min. 8 sec.
Open evacuation valve	0 min. 14 sec.
Evacuate	3 min. 46 sec.
Steam is cut in when pressure reaches 15 in. Hg abs.	
Close oil evac. valve	0 min. 12 sec.
Check closed	0 min. 8 sec.
Open air repressure valve	0 min. 12 sec.
Repressure	1 min. 16 sec.
Open main air valves	0 min. 20 sec.
Regenerate	10 min. 8 sec.
Close main air valves	0 min. 12 sec.
Check closed	0 min. 2 sec.
Open air evac. valve	0 min. 12 sec.
Evacuation	1 min. 24 sec.
Close air evac. valve	0 min. 12 sec.
Check closed	0 min. 2 sec.
Open oil repress. valve	0 min. 12 sec.
Repressure	0 min. 48 sec.
Total	30 min. 0 sec.
Repeat Cycle	
Open oil valves	
Etc.	

A portion of a typical commercial cycle is shown in the chart, Fig. 3. A typical sequence is given in detail in Table 1.

The overlap of these operations is

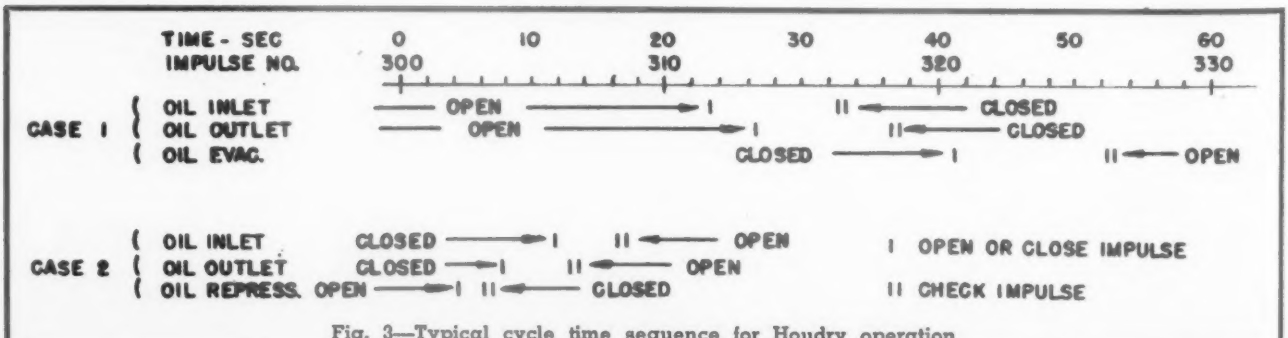


Fig. 3—Typical cycle time sequence for Houdry operation

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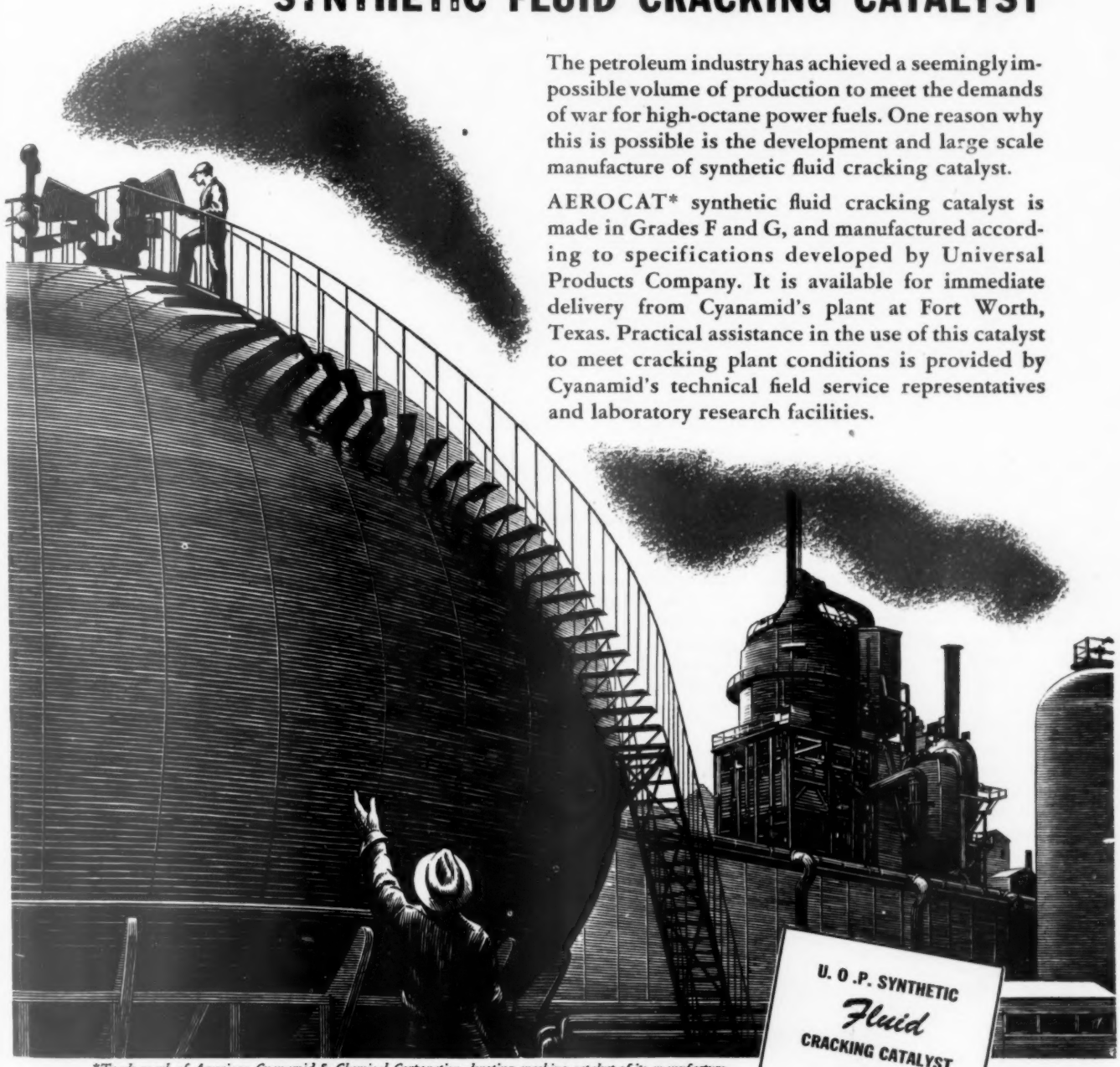

The petroleum industry has achieved a seemingly impossible volume of production to meet the demands of war for high-octane power fuels. One reason why this is possible is the development and large scale manufacture of synthetic fluid cracking catalyst.

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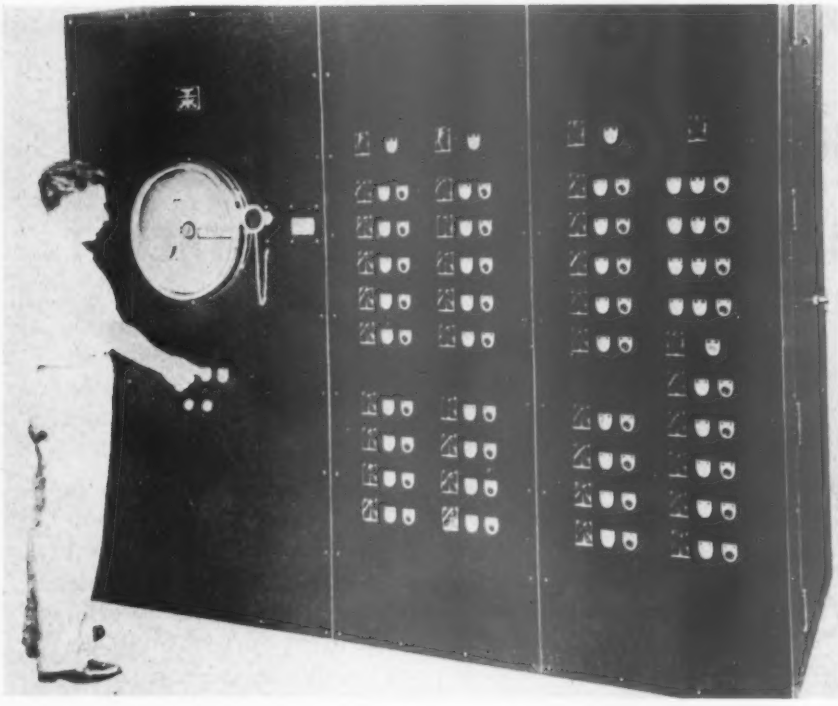


Fig. 4—Front view of dial type of cycle timer

shown in the sequence diagram. It is evident that the flow of oil and air to the cases is continuous. It should be noted that all important valve changes are checked before the next operation is started. In the event the check contact is not closed, the cycle timer is stopped automatically and an alarm warns the operator who then operates the cycle on the manual control until the difficulty is straightened out.

A second type of cycle that has been quite widely used in Houdry cracking plants differs from the above employing a regeneration period twice as long as the on-stream period. Four catalyst cases are involved in this cycle; one is always on-stream, two are being regenerated and the other is being purged. This type of cycle is adaptable to very short on-stream periods—as short as 7 minutes and 30 seconds,. since the cycle length here is determined by the minimum time for purging and valve changing, and not by the regeneration time as in the former case. This same type of cycle control has been adapted to other processes, some of which have far more complicated cycles. It is evident that almost any sequence of operations that may be required can be obtained in a fixed bed catalytic process.

Fig. 5—Rear view of dial type of cycle timer

Cycle Timer

Two general types of cycle timer have been used. The front view of the dial type is shown in Fig. 4, showing again the cycle diagrams (see Fig. 3). The rear view is shown in Fig. 5. There are 900 points of contact, arranged in 5 concentric circles, and the contact fingers wipe these pins to assure good contact. One impulse is made every two seconds. The cycle is easily arranged and changed if desired by plugging in leads to the jacks of the contactor and the jacks of the master control board. The impulses are transmitted through relays and through the interlock relays to the motor operated valves.

The second type of timer differs principally in the type of contactor. A picture of the jack type is shown in Fig. 6. The screw rotates at constant speed and is reversed at the end of each pass. Contact points are located in four lines and a wiping contact is made between the points and a bar located on a nut on the screw.

Both types of timer have been used for several years and have proved very trustworthy.

Motor Operated Valves

A considerable study of various types of automatically operated valve was made to determine the most suitable construction for frequent operation at temperatures in the neighborhood of 850° F. Hydraulic or pneumatic valves were eliminated on the basis of their failure to positive closure. The type used is a forged steel body gate valve, motor operated with a double check on closure through a torque switch and a positioning switch. In emergency, the motor can be declutched and the valve operated by hand or the motor can be operated manually from push buttons in the control room. It has been found necessary to give careful and continuous attention to the lubricants used to properly dampen the rotation of the shaft. Otherwise, it has been necessary to use magnetic brakes to lock the valve in closed position.

Since large size valves of this construction are quite costly, it has been desirable to install them with a venturi type contactor section ahead of and a similar section of piping following the valve. In this way 16 in. valves have been used for pipe lines up to 30 ins. and the

(*Continued on p. R-356*)

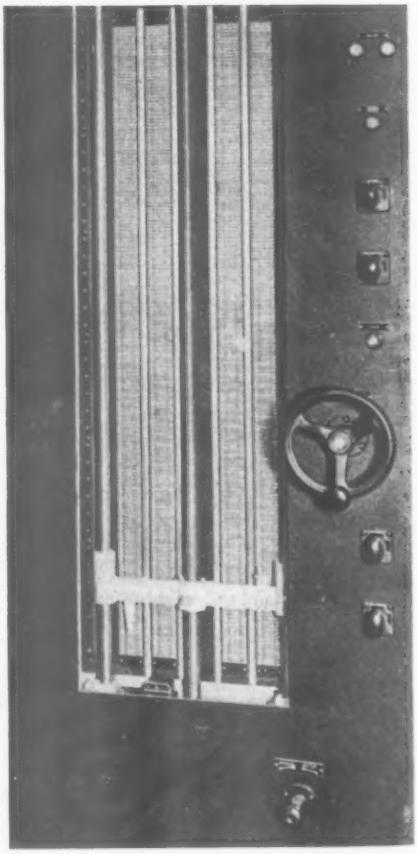
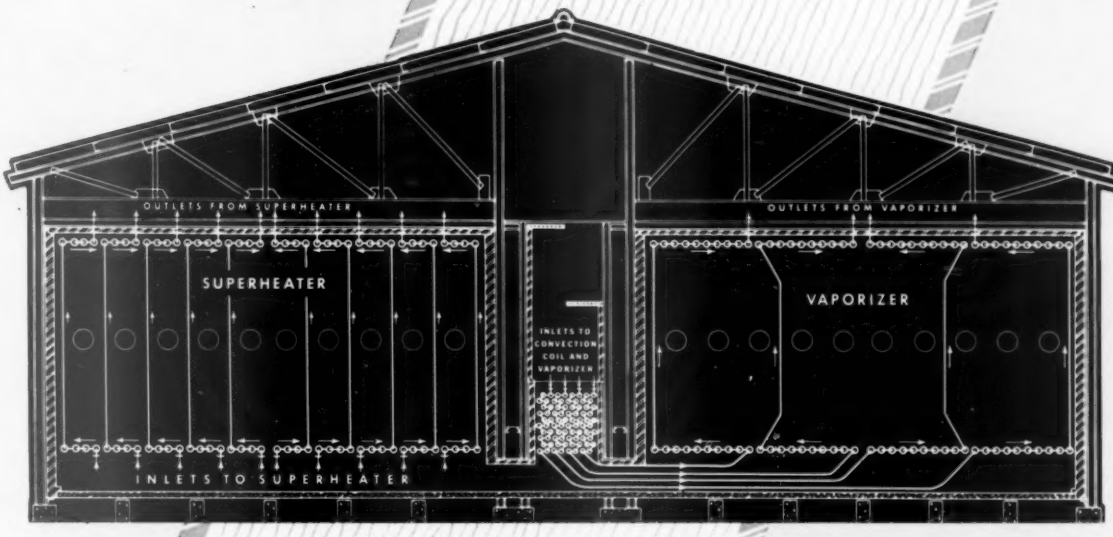


Fig. 6—Jack type of Houdry cycle timer

"DOWNDRAFT" OIL HEATERS



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2. Tube wall temperature to be less than 100 deg F. above superheater outlet temperature.
3. Pressure drop in superheater not to exceed 20 psi.
4. Sufficient flexibility to vaporize and superheat four different charging stocks varying in quality from 27.0 to 44.0 API.

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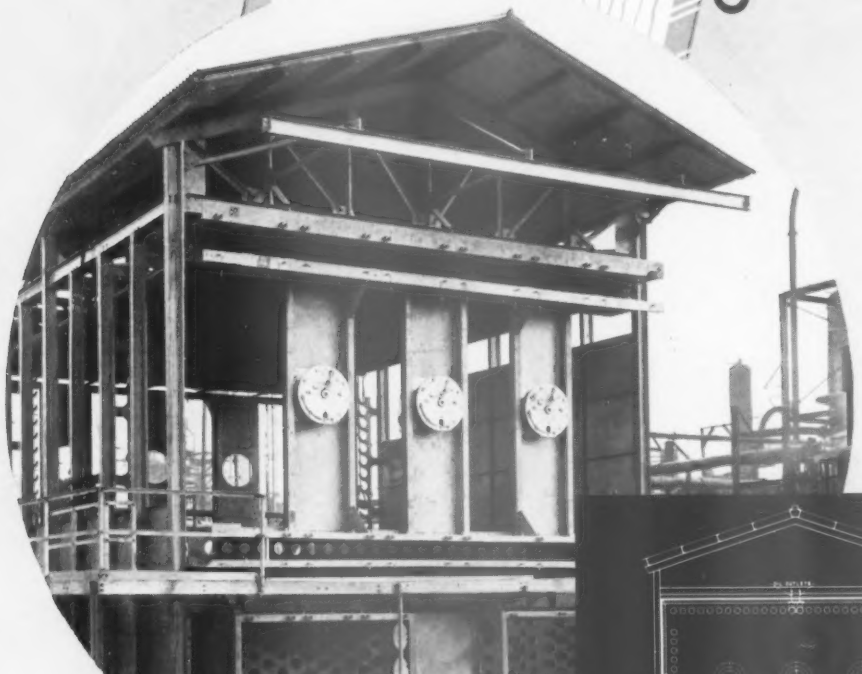
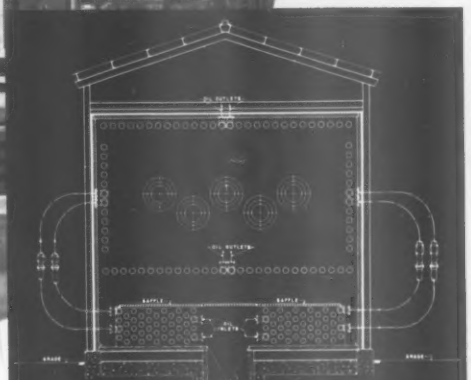


"DOWNDRAFT" under construction—a "skeleton" view



Simplified diagram showing oil flow and downward path of combustion gases

57,000 barrels per day, complete vaporization of heavy naphtha, or —57% vaporization of 108,000 barrels per day were the capacity requirements for this "DOWNDRAFT" heater recently placed in operation in a large mid-western refinery.

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Paloma Cycling Plant Repressures 23 Wells at 10,000-11,000 Feet

By E. W. McAllister

General view of Paloma Cycling plant. Fractionating columns and compressor house in center: control station for all pipe lines in the foreground

THE Paloma Cycling plant, the first plant of its kind in California and one of the highest pressure plants in the country, started operation on June 10, 1944. The plant is located in the Paloma field approximately 25 miles south and slightly west of Bakersfield.

The plant processes the wet gas and condensate produced by wells in the gas cap or condensate area of the field. The condensate, which exists in a gas phase under original reservoir conditions, liquefies or condenses due to retrograde condensation as the wells are produced. The unprocessed condensate has a gravity of approximately 54 deg. A.P.I., and between 7000 and 10,000 cubic feet of wet gas are produced with each barrel of condensate.

The plant is designed to process daily 50,000 mcf of total wet gas, separated from the condensate at successive pressure stages of 2000, 800, 300, and 75 pounds. The plant has three stages of absorption, 2000, 800 and 75 pounds, for processing the wet gas. The wet gas flashed at the 300-pound stage of gas and condensate separation is compressed to 800 pounds for processing at this pressure.

Feature of the operation of this unit cycling plant is a central manifold system controlling and measuring the flow from individual producing wells and to each individual gas injection well. The installation of the 3½-in. OD flow lines to individual wells from a cost standpoint is said to compare favorably with that comprising a main header system throughout the field, with laterals to individual wells.

The residue dry gas from the 2000 and 800-pound absorption stages is compressed to approximately 4500 pounds, the pressure required to return the gas to the reservoir. The dry gas is returned to the reservoir to maintain, as nearly as possible, the original reservoir pressure, thereby preventing excessive condensation within the reservoir and subsequent loss of liquid products. The residue dry gas from the 75-pound stage of absorption is utilized for field and plant fuel.

The rich absorption oil containing the raw gasoline vapors absorbed from the wet gas in the absorption process is distilled at 90-pound pressure to remove the raw gasoline and lighter ends recovered from the wet gas and again at 10 pounds to remove any heavy materials not desired in the lean absorption oil. The oil is then cooled and is ready for the recirculation.

The raw condensate from the 75-pound stage of gas and condensate separation is sent to the condensate debutanizer where it is processed, removing all butane and lighter fractions. The debutanized condensate of approximately 48 deg. A.P.I. gravity is sent to storage for sales.

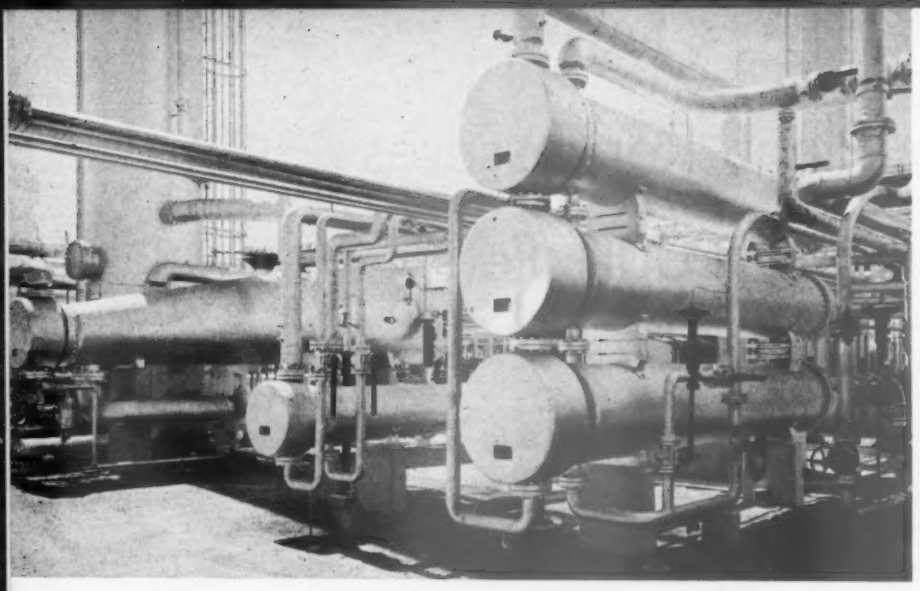
The butanes and lighter fractions resulting from the debutanization of the condensate are combined with the raw gasoline vapors and lighter fractions from the 90-pound still. The combined streams are sent to the depropanizer where propane and lighter fractions are removed by fractionation. The butane and heavier fractions from the depropanizer are then sent to the natural gasoline debutanizer where the iso and normal butanes are fractionated as a single product and sent to storage for sales, leaving a 16-pound or 17-pound R.V.P. natural gasoline, which is also sent to storage for sales.

The daily plant capacity for recovery of liquid products is:

Debutanized condensate	**5700 barrels**
Iso and normal Butane	**1200 barrels**
16# R.V.P. Nat. Gasoline	**800 barrels**

The plant has a potential capacity for recovering approximately 900 barrels

The accompanying article has been expanded by the author from an article appearing originally in the January-February, 1945, issue of the Flow Line, published by the Merco Nordstrom Valve Co. and Pittsburgh Equitable Meter Co. E. W. McAllister is Chief Engineer of Western Gulf Oil Co.



Heat exchangers for depropanizer and debutanizer at the Paloma cycling plant

of propane a day. At present the propane, in an impure state, is injected into the formation although facilities for taking a side cut of propane from the natural gasoline depropanizer are now being installed. These facilities will consist principally of storage and shipping equipment. Approximately 20,000 gallons of propane a day, or 50% of the available propane, will be recovered by the plant when this installation is complete.

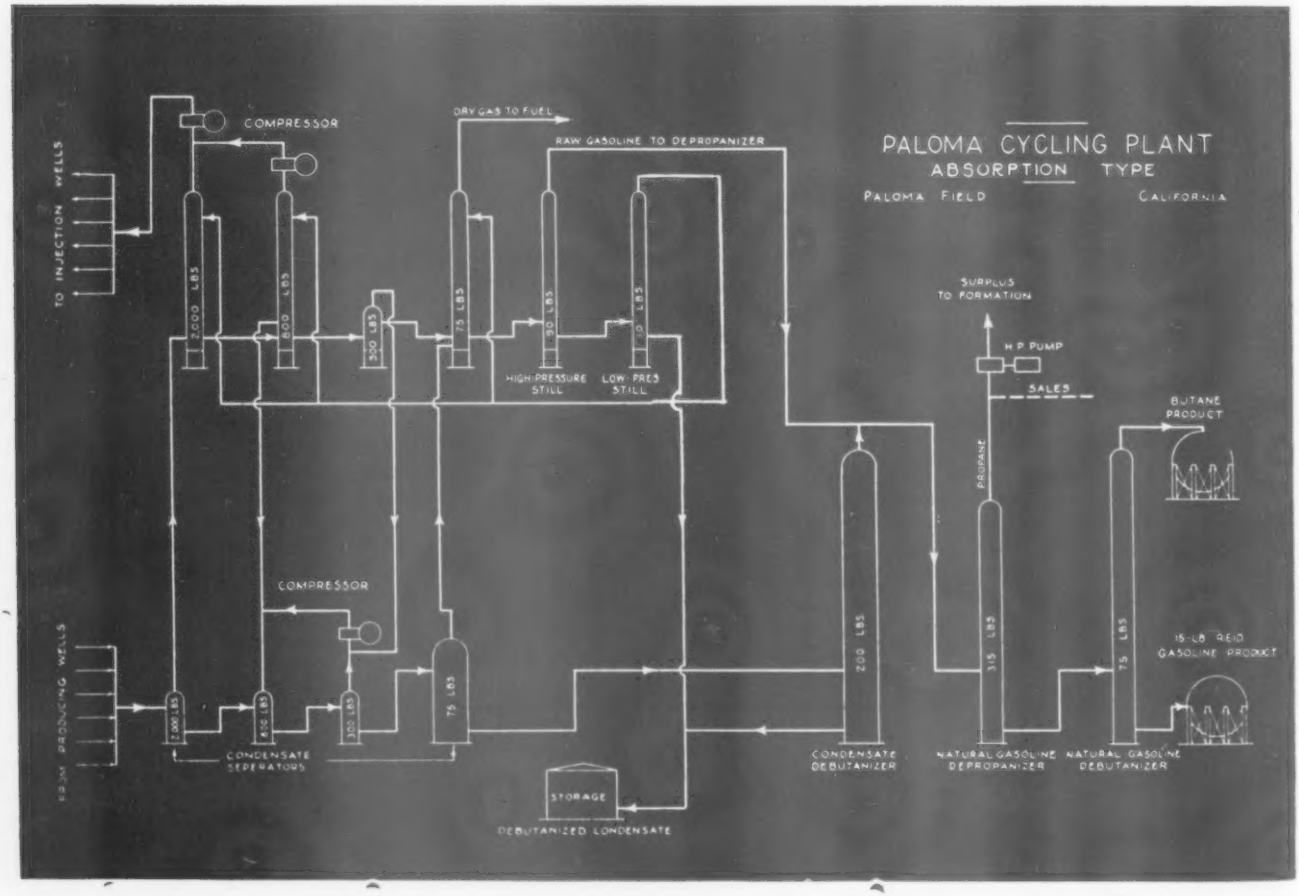
The compressor facilities consist of six 600 h.p. units equipped with four compressor cylinders each. The cylinders for the various services are so divided among the individual machines that if any one unit is shut down, the various services are reduced more or less proportionately.

The steam generating facilities for the plant consist of two 540 h.p., 3-drum water tube boilers. The plant has two cooling towers, one 320 ft. long by 55 ft. high, used for the plant processing operations and the other 160 ft. long by 55 ft. high for cooling the jacket water to the compressors and gas engines. The storage facilities consist of three 10,000-barrel cone deck tanks for storing the debutanized condensate and five 2500-barrel Hortonspheres, two of 50 pounds working pressure for storing natural gasoline and three of 100 pounds working pressure for storing butane. The storage facilities for propane now being installed consist of one 25,000-gallon horizontal cylindrical tank having a working pressure of 250 pounds.

The plant is equipped with the latest automatic controls and regulating devices. A signal light panel indicates to the operator at a glance whether the various plant equipment is operating satisfactorily. If not, the signal lights are augmented by an audible alarm system.

A master pressure reducing regulator maintains a uniform pressure on the flow to the plant. This regulator also closes if the plant pressure drops below a predetermined minimum, such as might be caused by a line break within the plant. The regulator may also be closed manually by remote controls in the plant area.

Of considerable interest is the plant's manifold system for controlling and measuring the flow from each individual producing well and to each individual gas injection well. This is made possible by the field pipe line system, which consists of 3½ in. O.D. XX individual pipe lines to each well. The flow to and from each well is controlled by



a Letter to an Advertising Agency*

POROCEL CORPORATION
250 SOUTH BROAD STREET
PHILADELPHIA 1, PENNA.

N. W. Ayer & Son, Inc.
Washington Square
Philadelphia 6, Penna.

Gentlemen:

Our forthcoming advertisement should be developed with the idea of bringing the potential usefulness of Porocel as a Catalyst Carrier to those people who are looking for a better material to support, adsorb, dilute, disperse or otherwise present or dispose the active catalyst to the reacting phases.

Enumeration of the properties of Porocel which would strongly recommend it as a Catalyst Carrier would include the following:

(a) Its properties as an adsorbent. Porocel is an active adsorbent, making it possible intimately to adsorb the active catalyst from an aqueous solution, thereby presenting it in an active, dispersed form.

(b) Porocel has a high surface area. Surface area is in many cases directly related to adsorptive power, and a high surface area carrier is always desirable.

(c) Porocel is rugged. The physical hardness of Porocel is such that the granule shapes are maintained in the presence of liquid or vaporous reactants under widely varying temperatures or flow conditions.

(d) Porocel will permit exact engineering design calculations, and predicted conditions of reaction and fluid flow will be maintained throughout the life of the catalyst.

(e) Porocel is inexpensive. Compared with the cost of most active catalysts, the cost of a Porocel carrier becomes a very small item.

(f) Porocel is produced in uniform granular sizes. This is advantageous for reasons given above.

(g) Porocel is chemically inert to most active catalysts and many organic reactants. It can, therefore, be relied upon to act only as a support in most cases, and as such, not interfere with the basic reaction.

Very truly yours,

C. D. Laughlin

Porocel Corporation

cal/jc

*This letter was written by an engineer—not an advertising man. It was intended simply to supply information for a Porocel advertisement on this page this month. But the letter was so clear and concise an outline of Porocel's properties that the copywriter said to himself, "Why gild the lily? Why not just run this letter as written and received?" . . . so here it is.

These high pressures *take*

Cross-section of mercury chamber, METRIC orifice meter (of 50-inch differential range); one of the construction features important in the accuracy and dependability of this instrument.

Note the large area of the float at the end of the very long float lever, which insures accuracy and sensitiveness in the pen movement on the meter's chart.

This is but one of the many features of design described in detail in Catalog EG-2, which we shall be glad to mail you on request.

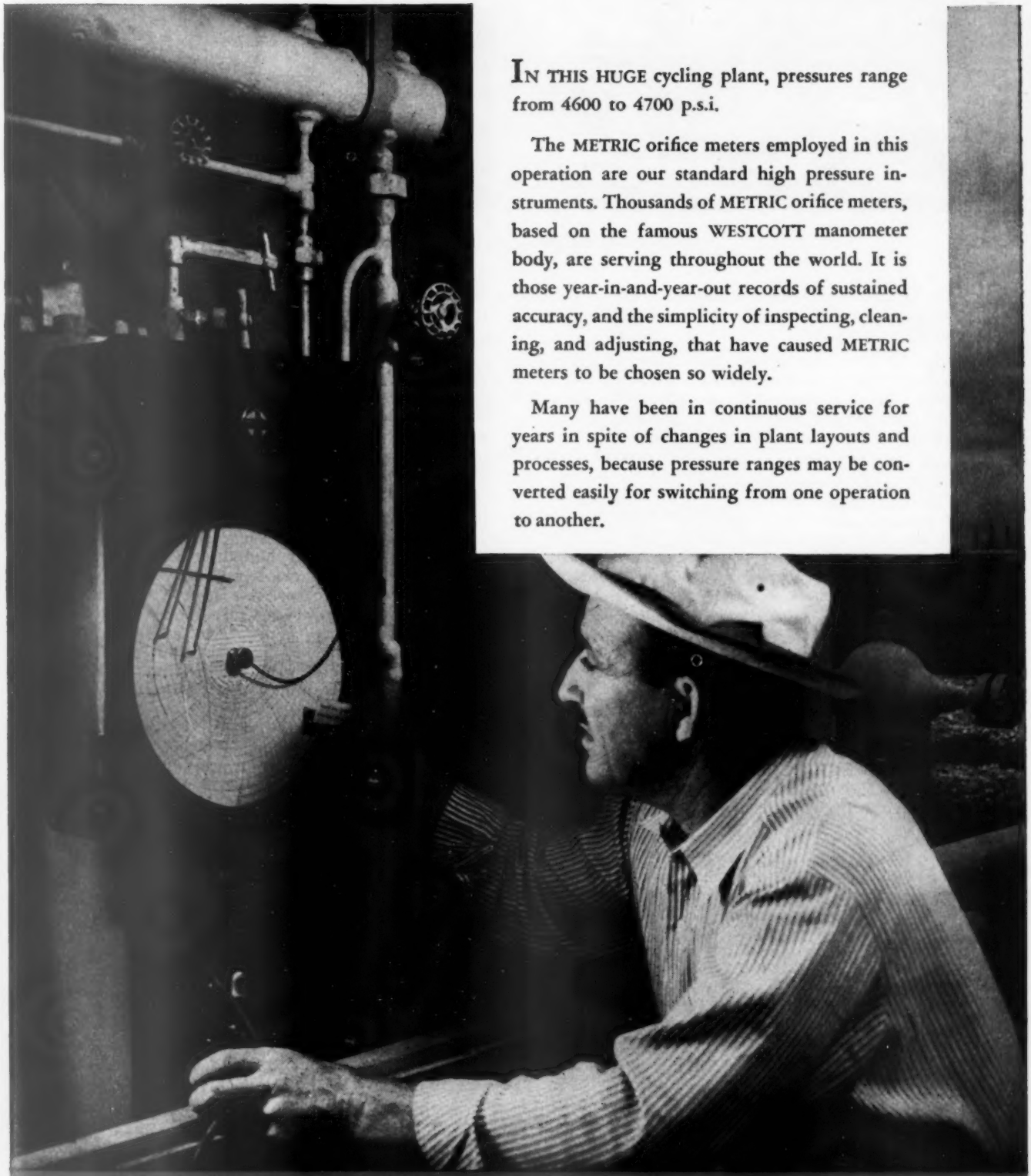
Outside adjustable pulsation dampeners in the bottom of the U tube connection are available.

AMERICAN METER COMPANY

INCORPORATED (ESTABLISHED 1836)

Albany • Baltimore • Birmingham • Boston • Chicago
Dallas • Erie • Houston • Kansas City • Los Angeles • New York • Philadelphia • Pittsburgh • San Francisco • Tulsa

the measure of a meter

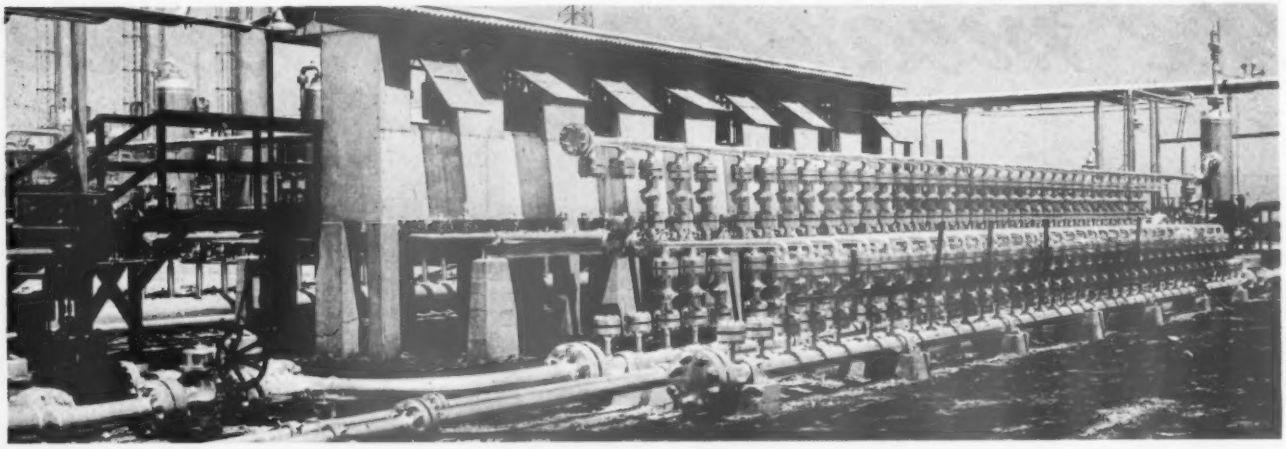


IN THIS HUGE cycling plant, pressures range from 4600 to 4700 p.s.i.

The METRIC orifice meters employed in this operation are our standard high pressure instruments. Thousands of METRIC orifice meters, based on the famous WESTCOTT manometer body, are serving throughout the world. It is those year-in-and-year-out records of sustained accuracy, and the simplicity of inspecting, cleaning, and adjusting, that have caused METRIC meters to be chosen so widely.

Many have been in continuous service for years in spite of changes in plant layouts and processes, because pressure ranges may be converted easily for switching from one operation to another.

METRIC orifice meter on input line of the Erath Cycling Plant, Erath, La., operated by the Texas Company under unitization agreement with other producers in the field. This is one of many standard METRIC orifice meters employed in the plant.



Central station for gathering lines from the wells

flow beans located at the plant header and is measured by orifice meters located also at the header.

In the case of the producing wells the meters measure both gas and condensate so that only a factor is obtained for allocating the plant products and gas processed back to the individual wells.

Each individual well line is connected to two main plant headers, producing and the injection. Also, the individual lines are connected to a third smaller header at the plant through which the wells may be produced or back flowed for checking the characteristics of each individual well and to check meter factors.

The installation of 3½ in. OD flow lines to each individual well from a cost standpoint compared favorably with the installation of a main header system throughout the field and laterals to each well taking off from the header system. This was due to the shape of the field which is approximately elliptical with a long minor axis in comparison to the major axis and the fact that the wells are spaced throughout the field rather than concentrated in two or three areas.

The individual line system, as well as simplifying the testing and control of the wells, also makes it possible to back flow the injection wells without comingling the dry gas back flowed with the wet gas to the plant, which would be necessary in the case of a field header system, thereby decreasing the recovery of plant liquid products during these periods.

The metering of the gas and condensate together as produced from the wells, prior to any separation, is believed to be rather unusual due to the low volume of gas produced with the condensate, which is between 7000 and 10,000 cu. ft. per barrel. Before the construction of the main plant, the metering of gas and condensate together was tried out for a considerable period of time at a pilot plant built for making gas injection tests. A vertical orifice meter run was installed ahead of the 2000-pound primary separator.

Tests were then made to determine if the metering of condensate and gas together was feasible and whether or not factors arrived at based upon tank condensate gauges and gas meter computations could be applied to the test meter chart for determining the gas and condensate production from a well prior to any separation.

The test meter run was first installed vertical with the flow downward through it with the idea that the condensate would have a better opportunity of passing the orifice plate without becoming trapped behind it. The meter was installed approximately at the height of the orifice plate and flange meter connections were used. When the meter was placed in operation the meter and lines became natural traps for condensate and water seal pots were installed. The water seals proved unsatisfactory since they were hard to balance because of the vertical meter run and with the least cold weather the water seals froze. Also, it was difficult to determine the gravity of the sealing fluid under 2000-pound pressure for coefficient calculations, although this factor may not have been important since it would have been constant for all meters.

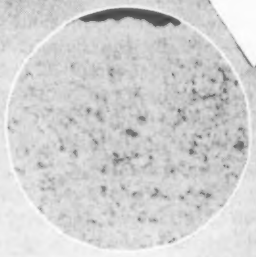
Finally it was decided to place the meter run in a horizontal position with the meter installed above the orifice flanges. Self-draining lines connected the meter to the meter run. To prevent fluid from backing up behind the orifice plate, the orifice was drilled off-center and placed tangent to the bottom of the meter run. The meter was placed in operation without seals and operated satisfactorily. No condensate was drawn up into the meter, as evidenced by high pressure gauge glasses placed in the meter lines as drips.

Pumping station for products leaving the plant

Each Well Tested

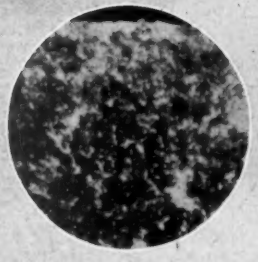
Inasmuch as each well varies somewhat in gas/oil ratio, tests must be made for each well to determine the factors to be applied against each individual well meter. This is done using the test separator at the plant de-

Enlargement approximately 123 x



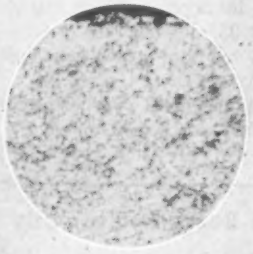
1. Before use

Filtrol's superior porosity is shown in this "slice" of Filtrol Catalyst. Note the uniformity of the unit, Montmorillonite aggregates in the "section" shown.



2. Used

The superior porosity assures maximum penetration to the core and also permits easy release of conversion products.



3. Regenerated

Natural strength and stability — with pore size that allows complete carbon burning — permits regeneration to extremely low residual carbon, insuring maximum yields with repeated use. Microphoto shows how completely conversion products have been released — porosity re-established.

Throughout America—in fact, throughout the whole world—wherever gasoline and lubricating oils are made you will find Filtrol Catalysts or Adsorbents played a vital part.

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General Offices: 634 S. Spring St., Los Angeles 14, Calif.
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PRODUCTS OF **Filtrol*** **CATALYSTS AND ADSORBENTS** RESEARCH AND DEVELOPMENT

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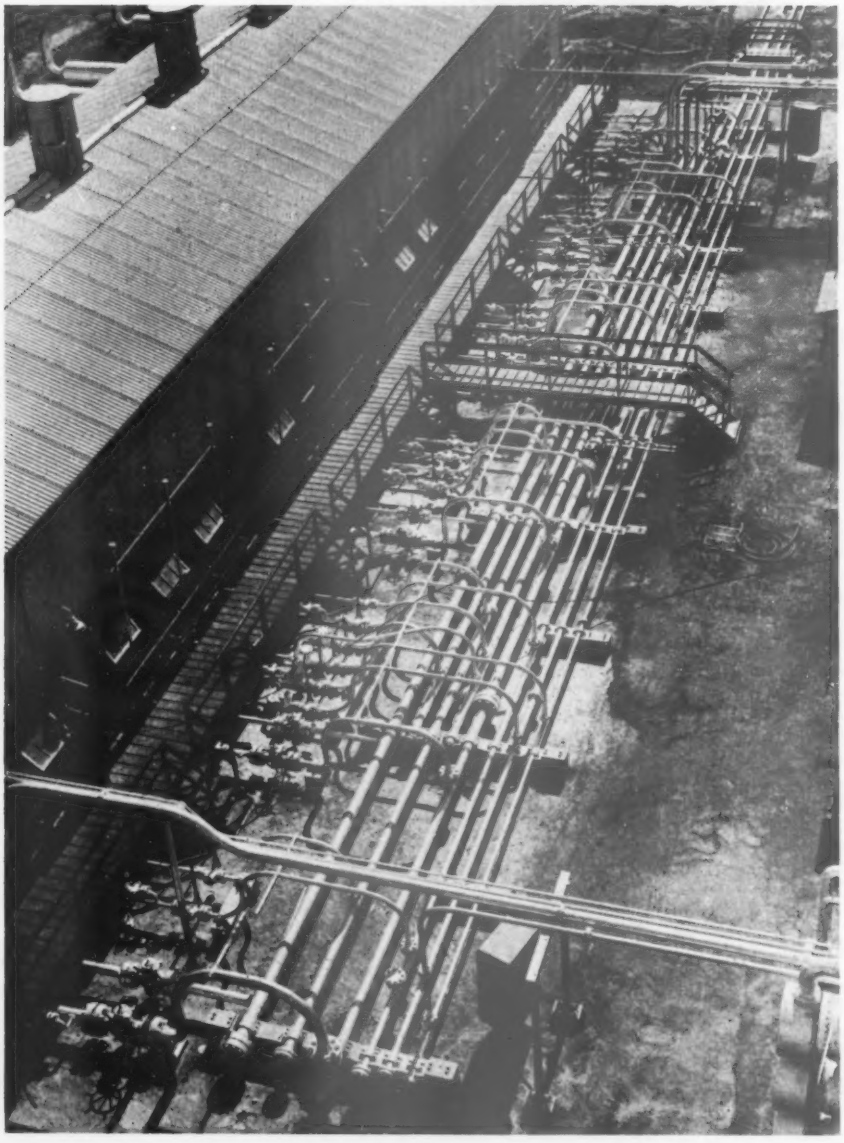

TOP—Battery of pumps handling flow to storage tanks at Paloma plant
BOTTOM—Compressor house and piping

scribed previously. Since pressure also influences the factors, all wells are throttled ahead of the meters which are connected to a common manifold upon which the plant pressure is maintained. In this manner all meters operate under the same pressure regardless of the individual well rates.

One point of general interest which developed out of the coefficient calculations when using the test meter was that when measuring gas at extremely high pressure, the weight of the gas over the mercury should be compensated for in the same manner as if using liquid seals. This factor increased the chart readings approximately 1% when measuring wet gas at 2200 pounds and dry gas at 4500 pounds.

The construction and operation of the plant and the development of the field is supervised by the Western Gulf Oil Co. for the Paloma unit, consisting of six companies who have unitized their acreage for the cycling project. Participating companies are:

Barnsdall Oil Co.
General Petroleum Corp.
The Ohio Oil Co.
The Texas Co.
Union Oil Co.
Western Gulf Oil Co.

The policy for operating the field and plant is determined by the Paloma Operators' Committee made up of members of the participating companies. R. P. Huggins, Western Gulf Oil Co., is chairman of this committee and R. M. Dillard is plant superintendent.

At present the unitized area consists of better than 3100 acres and may be expanded as outside acreage is proved productive. At present there are 23 wells drilled on the unitized acreage. These wells vary between 10,000 and 11,000 feet in depth. Black oil of approximately 33 deg. A.P.I. gravity has been found on the north flank of the structure.

The plant and field pipe line system were designed and constructed by the C F Braun Co. of Alhambra, Calif.

Order Reprints Promptly

Inquiries for reprints in quantities of articles appearing in NPN's Technical Section should be forwarded promptly after receipt of the issue, by telegram if possible. Present conditions make it impossible to hold the type in the forms after the issue has been published and reprints ordered after the type has been broken down have to carry the additional cost of resetting the article.

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Possibilities of Gasoline Engine Development

By Forest S. Baster

Postwar fuels will be the most outstanding contributor to higher efficiency and horsepower output in future gasoline engines and will greatly influence engine designs, predicts the vice president in charge of engineering for one of the country's largest producers of motors for commercial vehicles. He foresees engines of 160 H.P. developing 200 H.P. when supercharged, and estimates that improvements in fuels and higher compression ratios alone will increase engine efficiency 10 to 15%.

He believes that non-premium motor gasoline of at least 90 octane rating will be used in these new engines, and claims that it will be far superior in road performance to the prewar 87-90 octane aviation fuels.

Engine manufacturers will redesign their engines to take advantage of many wartime developments, including supercharging, bearings which accommodate pressures of 2000 psi, automatic camshaft timing change mechanisms giving top efficiency at all speeds, injection carburetion, new low tension ignition systems, and new spark plug electrode materials.

IN ATTEMPTING to forecast the future gasoline engine, one must first recognize that the gasoline engine is a heat engine and it is only through increased thermal and mechanical efficiency that we may expect to extract more actual foot pounds of work from a dollar's worth of fuel.

Perhaps it would be best to review a bit of the past history of commercial truck and bus engines with regard to compression ratios, average RPM at peak horsepower, pounds per brake horsepower and average displacement. Fig. 1 shows that the compression ratio from approximately 1905 to 1925 stayed constant at 3½ or 4:1. At that time a comparatively rapid increase in compression ratio started to take place and the average list in the trade journals as of 1940 is approximately 6:1.

In Fig. 2 it is shown that for the same period, that is up to 1925, the average engine in a commercial vehicle had four cylinders; and in the next ten years there was a rather rapid swing to six cylinders.

In Fig. 3 we see that over this same period of years the engine weight in pounds per brake horsepower output has gradually decreased from approximately 35 pounds in 1905 to a little less than 10 pounds in 1940.

Fig. 4 shows that the average road speed at which the commercial vehicles have been governed has increased in a rather smooth curve from approximately 9 miles per hour to today's 50 plus miles per hour.

The accompanying article was originally presented before the S.A.E.'s West Coast Transportation and Maintenance Meeting, Portland, Ore., Aug., 1944. Forest S. Baster, the author, is vice president in charge of engineering for The White Motor Co., Cleveland.

The displacement of the average commercial engine (Fig. 5) has in the meantime decreased from about 380 cubic inches to approximately 330 cubic inches. Despite this decrease in displacement, the horsepower outputs (Fig. 6) have increased about six times to a point where the average engine is very closely approaching 100 horsepower.

In Fig. 7 you will note that the governed RPM has increased meanwhile from 1,000 RPM to 3,000 RPM. All of the above figures and charts were obtained by analysis of trade journals over this period of years.

If we project these same curves on into the future with approximately the same rate of change, we will arrive at horsepower, speeds and weight per horsepower which, at first glance, appears to be a rather fair improvement. We believe, however, that we cannot just project them at the same rate of increase, for during the past few years under war-time stress we have made progress at a considerably faster pace than in normal peace times.

Fuels Important in Future Engine

Our consideration of the engine of the future must be based on fuels available as well as materials which we will have available at this time. There have been remarkable improvements in gasoline and oil technology, as we all know, forced upon us by requirements for higher and higher outputs and BMEP for combat aircraft. For this engine of the future we believe that the non-premium gasoline will be at least 90 octane and the lighter alloys (aluminum and magnesium) will be priced competitively with cast iron.

This 90 octane fuel will be far superior in *road* performance to the 87-90 octane fuel which was available before the war as aircraft gasoline. It has been found that the octane rating arrived at by the ASTM or so-called motor method, or by the CFR—Research Method, does not give a true indication of the performance of gasolines on the road. For some time we believed that a combination of these two methods, or the sensitivity, as it was called, gave comparatively good correlation with road performance; but since that time the CFR road testing has developed the fact that some gasolines even though rated the same by each of the two methods gave quite different performance upon the road.

During the past few years oil technologists have succeeded in building gasolines practically to order. Fig. 8 shows the curves of three different gasolines, all with the same ASTM octane number and two of them with the same Research octane number. The normally aspirated engine has an octane requirement shown by the dot and dash line decreasing as engine speed is increased.

Predicts 200 H.P. Engines

As can be seen from the chart, gasoline "B" with an 80 rating by ASTM and Research will be of too low a quality for speeds below 1800. Gasoline "A" does somewhat approach the typical slope, whereas, gasoline "C" with the same rating by ASTM and Research methods shows that it would be possible to increase the compression ratio of the engine were the manufacturer certain that no other gasoline other than those similar to "C" were ever going to be used in that engine.

Now let us look into the crystal ball and see what the future holds for us. Engines will, in all probability, be no smaller physically than those now in use but will have considerably higher output. In the not too distant future it is easily conceivable that we shall have engines developing 165 BMEP unsupercharged and 200 BMEP supercharged with .55 to .6 horsepower per cubic inch in the normally aspirated engine and even more in the supercharged version.

Perhaps this seems to be shooting for a star, but you may remember that a paper given in New York in Nov. 1938, forecast 125 BMEP. At the moment that seemed audacious, but within a year that goal had been surpassed. There is today an engine which is developing over 140 BMEP with 80 octane fuel, so we are well along the way, and this forecast of 165 BMEP may also prove to be too conservative.

The cost of these engines will be lower when measured in dollars per horsepower, even though the dollars per cubic inch of displacement may rise due to better quality of materials which in

Ready for you to "give 'em the works"

What aluminum alloy will perform best on a specific task?

Tests at Alcoa's Research Laboratories can evaluate the corrosion resistance of aluminum alloys under approximate operating conditions. But, put into service, some seemingly unimportant factor may alter the entire picture—minor impurities in materials being processed, flow rates or temperatures. Test exposure *on the job* is indicated, therefore.

The specimens pictured here were prepared by Alcoa for this purpose; other sizes and shapes also are available. They're now being exposed in existing equipment. They'll be returned after a suitable period for minute examination, and Alcoa's recommendations will be based on those findings.

Such tests take time. You should be making plans now for employing aluminum. ALUMINUM COMPANY OF AMERICA, 1869 Gulf Building, Pittsburgh 19, Penna.

Selected samples of Alcoa Aluminum Alloys mounted for an exposure test.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

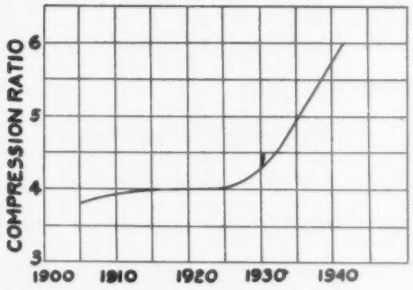


Fig. 1—Compression ratio changes for 3 to 4-ton truck engines (averaged). During the 1905-1925 period, the ratio stayed relatively constant at 3½ or 4:1, and then started an upward trend, reaching approximately 6:1 in 1940

turn contribute to longer life and lowered maintenance.

These higher outputs will be needed for, after the close of hostilities, this nation will undoubtedly have an era of road building which will produce main intersectional and transcontinental roads which will permit high speeds, and which in turn may lead to legislation as to minimum speeds that must be maintained even on the upgrade. This minimum speed will be such that more and more power will be needed and we manufacturers will supply it.

Many Ways to Increase Power

In order to do this, we will undoubtedly have to take full advantage of the fuel and completely redesign our engines to most advantageously use fuels we believe will be available. Fuels alone should allow 10% to 15% increase in output with very little change other than that we put in high compression pistons or shave a little off the head. There are quite a number of ways in which additional performance can be obtained, some of which may appear at the moment to be "gadgetry"; but with further intelligent engineering development some of these may become quite the acceptable thing.

With the increase in compression ratios, for instance, spark timing will perhaps become much more exact than that given by our present day distributors with their rather wide tolerances as built in today's production. Distributor points have been a source of a good many headaches for, as the fiber block wears, spark timing on the engine changes and the need for frequent maintenance has been a nuisance.

There are at least two and possibly three different ways known at the present time by which these points could be eliminated. These systems would require a few electronic tubes but that can no longer be considered very much of a hazard for in so many of the aircraft wrecks where the plane has been a complete washout, the one piece of equipment that can most frequently be salvaged is the radio and its tubes.

New ignition systems are being developed which may eliminate the present high tension secondary leads with their accompanying tendency to leak, have corona breakdown and sometimes even cross fire. These new systems use low tension distribution and step up the voltage at the spark plug. With higher pressures at full loads and probably leaner mixtures at full and part load both new spark plug design and higher impressed voltage on the plug points may be required in order to fire the mixture.

Spark Plugs Being Improved

Spark plugs, too, are being developed rather rapidly. Progress is being made with electrodes of platinum and tungsten; some using thorium too are now in production. These metals and alloys are used to increase the emissivity, or in other words, more easily to surround the points with electrons so that the spark might jump across the gap with a lesser impressed voltage.

The mechanical design of the plug is also being improved and plugs will now operate for very much longer periods even with the heavily leaded fuels. As an example of this, a small and what might apparently be assumed to be a comparatively unimportant change in electrode positioning and spacing gave an extension of time between servicing of approximately 10 times or 1000%.

Another change permits control of the temperature of the center wire which has been the hottest part of the plug. With these improvements and others now under development, we may be fairly confident that the spark plug manufacturers will keep pace with anything that the commercial vehicle will require.

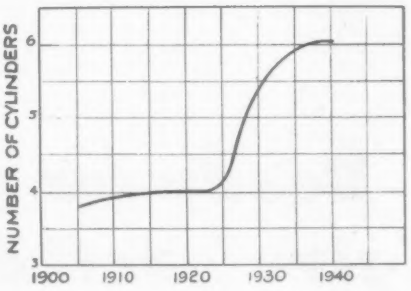


Fig. 2—Average number of cylinders in the commercial vehicle engine. As with compression ratio, the number of cylinders stayed relatively constant at four until 1925 and then began an upward trend to six

Bearing materials have been improved tremendously in the past few years under the stress of aircraft development. In today's engines copper-lead bearings are widely used both for main and connecting rod big ends. In the latter use, the loading is in the vicinity of 1,200 psi. These bearings carry manufacturers' rating of about 3,000 psi. Bearing manufacturers are aiming and seem to be fairly confident of obtaining bearings that will handle loads of more than 2,000 psi, with the same relative margin between actual and manufacturers' ratings. This manufacturers' rating is made on standard bearing test machines which are used with slight variations by each of the bearing makers. Wear is measured after a given time with the rated load and if the wear falls below a previously established figure the bearing is approved for this rating.

Bearings of Aluminum, Silver

Aluminum bearings seem to be potentially capable of rapid development. Silver bearings offer quite a bit in load carrying capacity and it is stated that they will permit extended life of the crankshaft. However, at the present time the silver bearing costs from two to three times that of the best present day copper-lead bearing. New methods of manufacture including the plating process may considerably reduce the final cost of a bearing of this type and if it can be used for greater mileages will certainly be acceptable.

In connection with the plated bear-

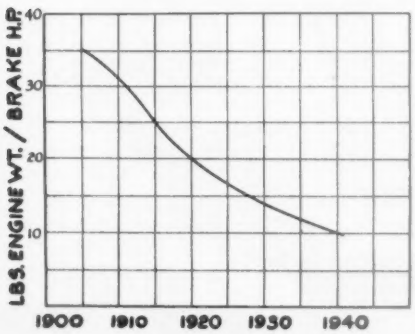


Fig. 3 (above)—Engine weight per brake horsepower, which has gradually decreased from about 35 lbs. in 1905 to a little less than 10 lbs. in 1940

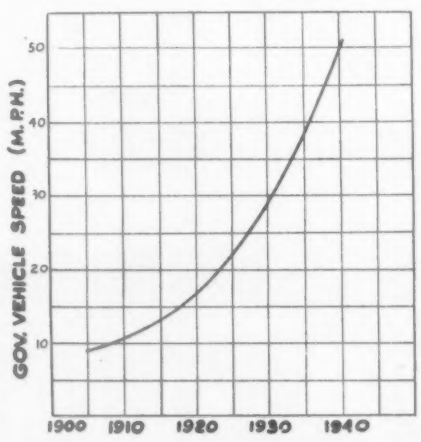
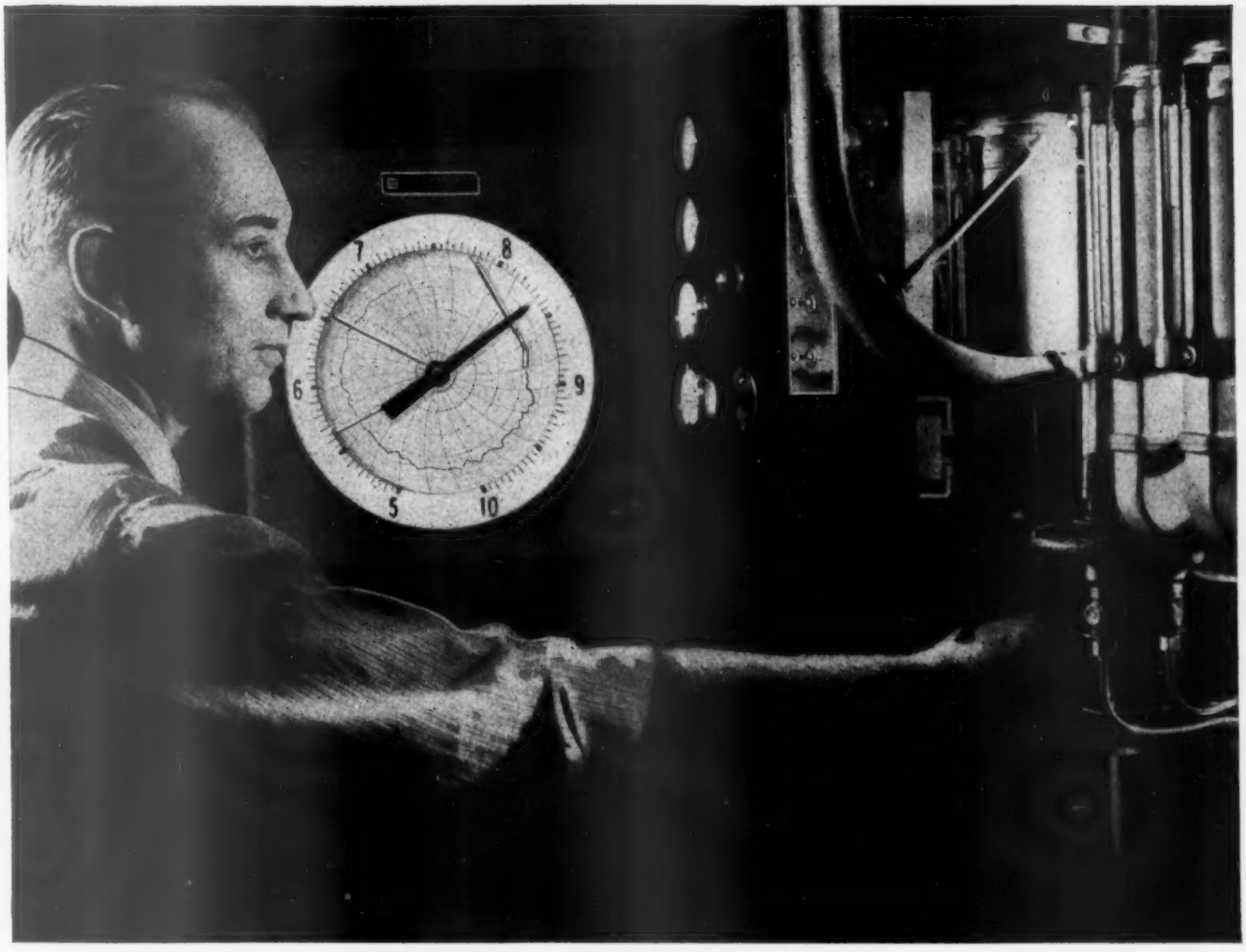


Fig. 4 (right)—Average road speed of commercial vehicles. Since 1905 the speed has increased from less than 10 mph to greater than 50 mph in 1940



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The Brown *ElectroniK* Potentiometer shown above fulfills these requirements. Operating on the unique *ElectroniK "Continuous Balance"* Principle, this instrument is capable of supplying instantaneous corrective action so necessary to petroleum processes.

The Brown *ElectroniK* Potentiometer differs basically from the conventional galvanometer in its balancing operation. Instead of the galvanometer and associated mechanisms, the Brown *"Continuous Balance"* unit is used—an electronic detector which makes it possible to take full advantage of thermocouple responsiveness.

Affording greater sensitivity—precision—ruggedness—and simplicity, the Brown *ElectroniK* is just as easily installed as a mechanical potentiometer. It requires no special wiring or shielding of any kind. Line resistance or lead lengths fade into insignificance.

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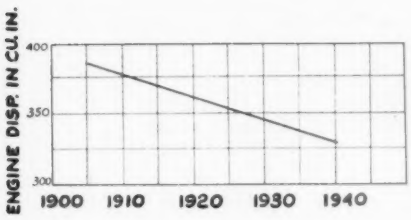
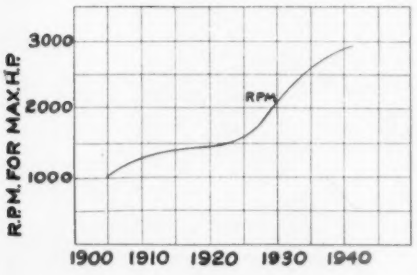
BROWN *Electronik* POTENTIOMETERS





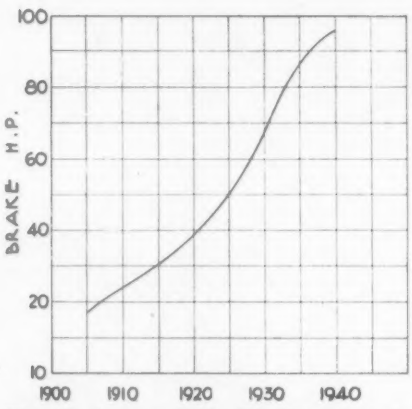


Fig. 5 (upper left)—Displacement in cubic inches of the average commercial engine for the same load-carrying capacity

Fig. 6 (above)—Yearly increase in power, 1905-1940

Fig. 7 (lower left)—Governed RPM changes

ing, the art and knowledge has progressed rapidly during the war and special platings of .0005-in. on a bearing can apparently make all the difference between one which will run 100,000 miles or more or fail in a few thousand miles, indicating that texture of the finish as well as compatibility of the metals can be a big factor in increasing bearing capacity and life. To date, lead and indium have been the metals most often used in the plating of commercial bearings, but considerable research has been going on with the plating of other metals and much is expected from this research.

With engine speeds increasing it seems imperative that we keep our piston weights as low as commercially practicable and this seems to point rather definitely to the continued use of aluminum. We know that ring groove wear is sometimes rather rapid when air cleaners are not serviced often but that is a completely separate problem. Aluminum pistons may be produced by new methods or combinations of methods now in use so that the future piston may come from a machine which will produce a combined forged and extruded piston. These may be both stronger and cheaper to manufacture, even cheaper than the permanent mold casting.

Chrome Plated Rings Wear Longer

The technique which has been developed in manufacture of aircraft rings will be continued in the production of commercial and passenger car rings. Chrome plating of the compression rings has shown a decided improvement in wear characteristics. It has been found that both the wear on the ring and the wear at the top of the cylinder barrel has been decreased remarkably, particularly when some dirt is present. Ring tension and radial distribution of ring pressure studies have been carried on and better sealing and better oil control can be expected.

A number of today's commercial engines of comparatively high output have been using the sodium-cooled exhaust valve. While the cost of these valves seems today to be rather high, methods of manufacture are now being developed whereby the cost can be materially decreased without affecting life. Metallurgical advances in valve steels have progressed so that in engines of moderate output it may be possible to use more economical plain valves.

Valve seats are being developed which may take care of some small misalignment and eccentricity of the valve or a head which is slightly tipped out of the plane perpendicular to the valve stem. These seats have been tried in some very high output engines and have given a very good account of themselves.

Larger Oil Pump Capacity

Oil pump capacity will undoubtedly have to be increased, for with higher bearing loading, as well as higher rubbing speeds, more heat will have to be carried away by the oil and oil may even be used for piston cooling as it is in a number of today's Diesel engines.

With this increased load on the oil, filters will have to take a greater part in keeping the oil in good condition and will have to do so with little or no attention. The filter that will efficiently service a high output engine will not be just a blown up version of today's filters, for space in the engine compartment is even now at a premium and will continue to be in the future. Filters along with all other accessories must improve their efficency as the engines are being improved so that they will not end up by requiring twice as much space as the engines themselves.

Oil coolers must also be considered, as they too will have a bigger job to do in taking care of the additional heat which higher specific output entails; despite this higher specific output we should be able to use the better grades of oil available today.

Carburetors are and will continue to be improved, in order to give more accurate and constant mixture ratios with better atomization to facilitate more even distribution among the cylinders. One way in which this might be accomplished is by adapting some of the characteristics of today's aircraft engine injection carburetion. This same adaption might readily have an altitude control worked into the design at very little additional cost. This would undoubtedly be a great benefit to those truckers who are operating over mountainous country.

Fuel Injection Has Possibilities

Injection carburetion naturally leads to the possibilities in injection. This may resolve itself into direct, manifold or port injection and appears to offer many possible advantages, including that of a supposedly lower engine octane requirement with injection as contrasted to carburetion.

We are all cognizant of the effect of heat in reducing volumetric efficiency, yet most engines have an exhaust-heated hot spot or a water-heated intake manifold. The distillation curve of the average automotive gasoline has a fairly high end point, and, without the addition of this heat, distribution would be very difficult, for the wet ends of the fuel must be vaporized to get good distribution.

With either direct or port injection the manifold would have to handle only air and, therefore, can be cold, thereby increasing volumetric efficiency and output over the entire speed range. Considerable work will, however, have to be done in the development of the necessary controls, but when these are worked out we will, undoubtedly, find other advantages which at the moment seem to be of little consequence.

Little Known About Water Injection

There has been quite a bit of discussion of the possibilities of water injection for commercial engines. This has been a natural result of the use of water injection for momentary bursts of power in combat aircraft engines. Considerable work was done on this problem at Wright Field about ten years ago and described by Ford L. Prescott at an A.S.M.E. meeting in St. Louis in 1935. At that time a definite increase in thermal efficiency was noted. This has been corroborated by further testing since then. In commercial engines

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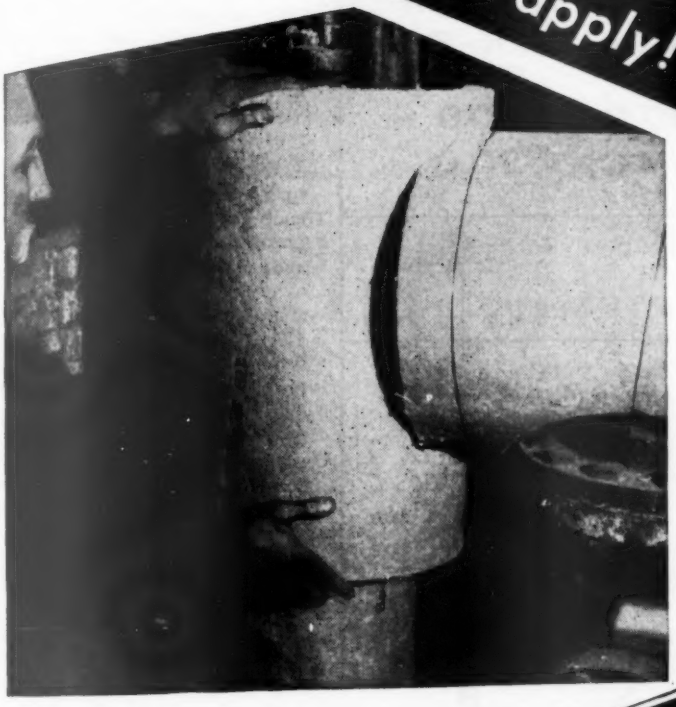

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we do not at the moment know whether other effects may be present such as rapid rusting, increased wear or deterioration of the lubricants. There is much to be done on this problem and the possibilities look inviting. Injection of any type still is too expensive and will have to be materially simplified and reduced in cost to compete with a simple carburetor.

There are a number of design factors each of which will lend its little bit to the final increased performance of the future engine. One possible advantage may be illustrated by Fig. 9 which shows the effect of timing of the valve events on engine performance.

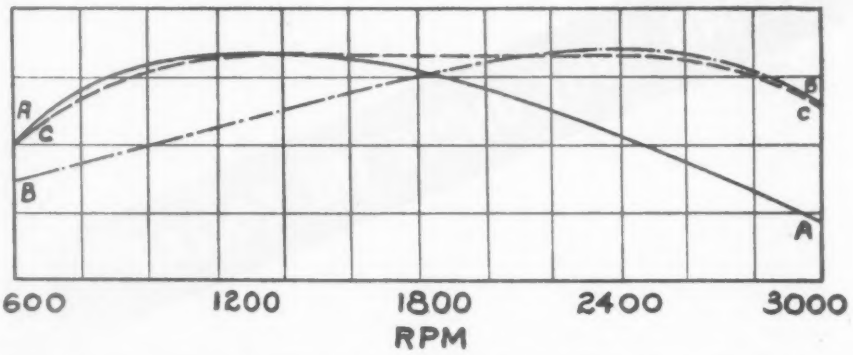

Fig. 9—Effective valve timing. Curve "A-A" shows timing set to give a torque peak at comparatively low engine speeds, and curve "B-B" at comparatively high speeds. By automatic changes in the camshaft timing, controlled by speed, these two curves can be combined (curve "C-C") to include the high torque characteristics of each

Speed to Control Timing

One curve in Fig. 9 shows a timing to give a torque peak at comparatively low engine speeds approximately 800—1,000 RPM; while the other curve is a typical torque curve of a high speed passenger car type—timing giving a torque peak of approximately 2,200 to 2,400 RPM. These two curves may be combined in one engine by an automatic change in the camshaft timing controlled by speed so that the final curve of the engine would be a curve shown by the dotted line combining the high torque characteristics of each curve. This will give a much better performing engine on the road.

We now come to the problem of supercharging and the results that we may expect from an engine with an integral supercharger design. It is generally accepted that the roughness of an engine with a compression ratio increased to take full advantage of high octane fuel will be sharper and more objectionable than that of an engine which uses supercharging with a lower compression ratio to take full advantage of this same fuel.

Since indicator cards taken on an actual engine run both with very high compression ratio and with a low compression ratio supercharged to approximately the same output are very difficult to obtain we would like to present here a few curves which are mathematical or ideal curves. The first of these (Fig. 10) shows the ideal otto cycle with a compression ratio of 6:1. This you will notice has a peak pressure of 991.4 psi and a peak temperature of 5497° F. These pressures and temperatures are, of course, theoretical and are never reached in an actual engine.

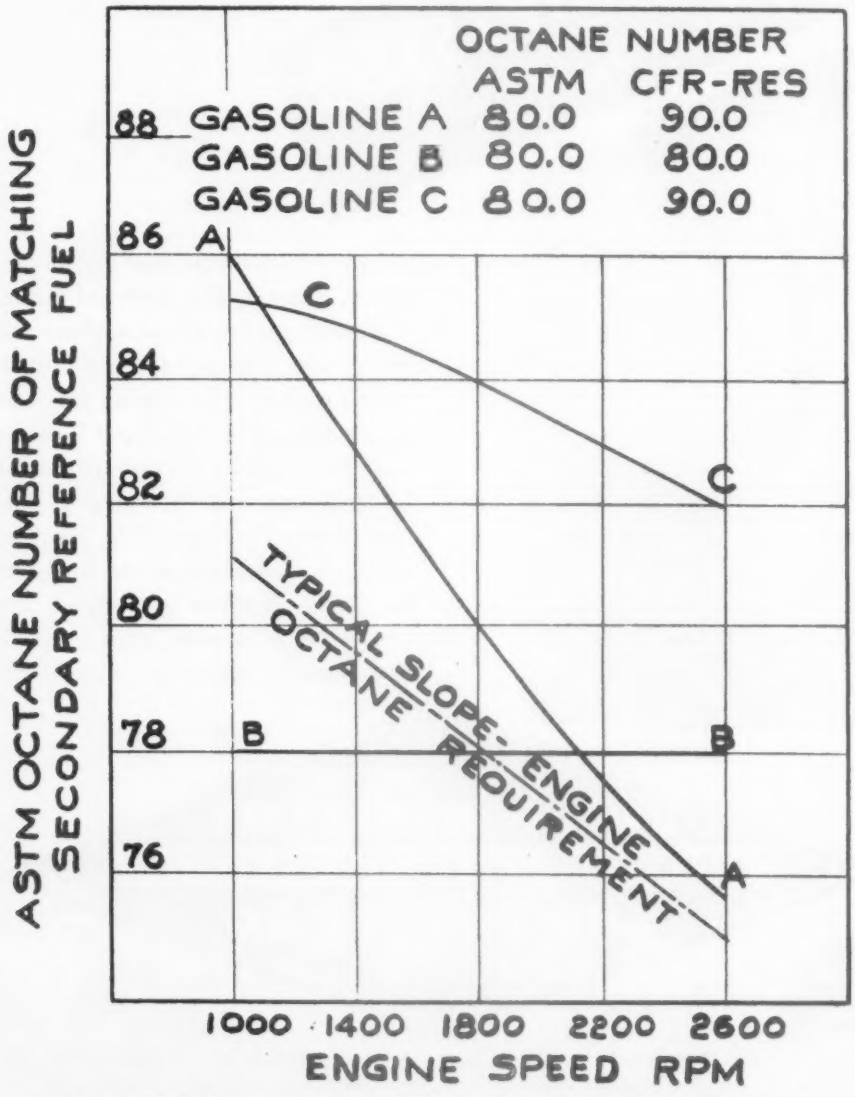

Fig. 8—Variation in equivalent ASTM octane number with engine speed

Efficiency Increased 17.8%

Now let us consider that we are given a fuel of sufficient octane quality that we can run with a 10:1 compression raio. Fig. 11, our 10:1 compression ratio engine, shows peak pressures of 1,830 psi and 6129° F. temperature. This, on the theoretical card, shows an output of 117.8% of the first 6:1 card.

Now then let us assume that we supercharge to 4 psi and maintain the 6:1 nominal compression ratio. Fig. 12 shows that we have peak pressure of 1227.1 psi and peak temperature of 5724° F. showing 122.7% of the 6:1 output. From the shape of these cards, each of which would be considerably modified in an engine, you can readily see that peak pressures alone may cause a more objectionable roughness and per-

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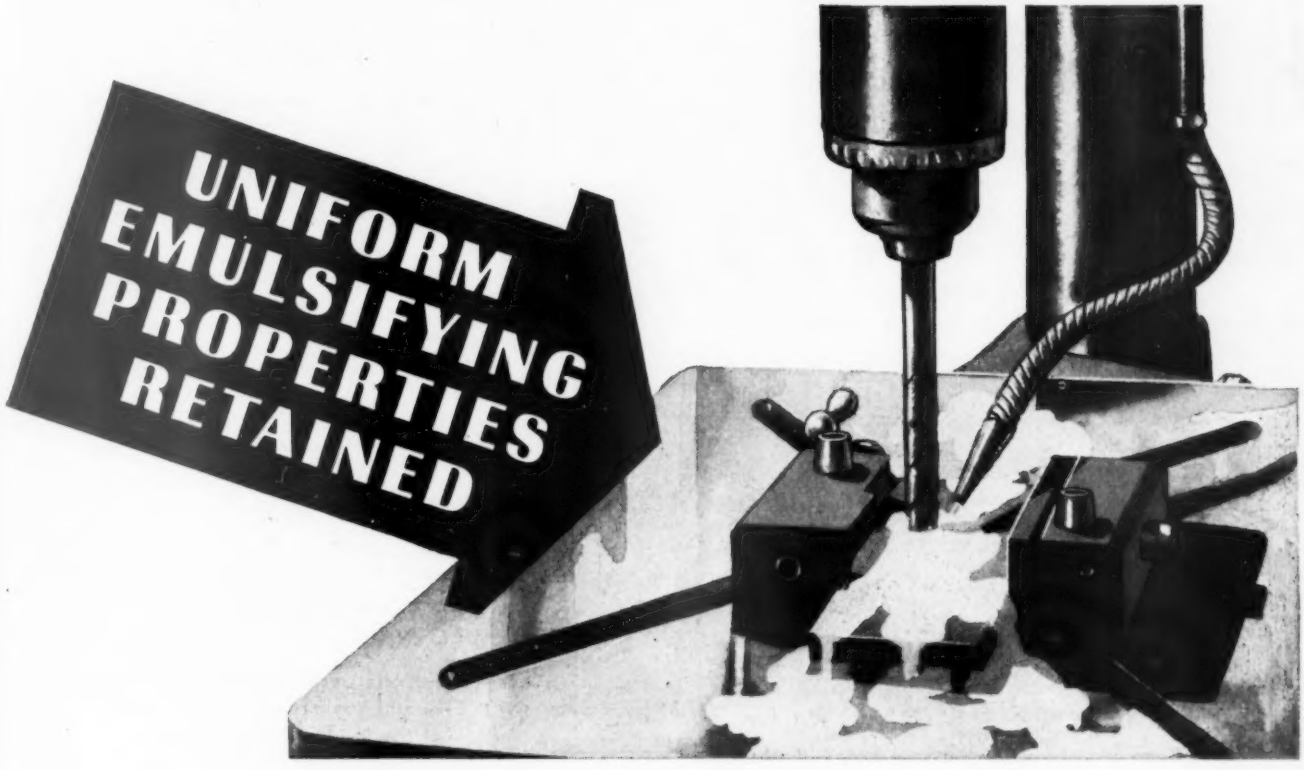

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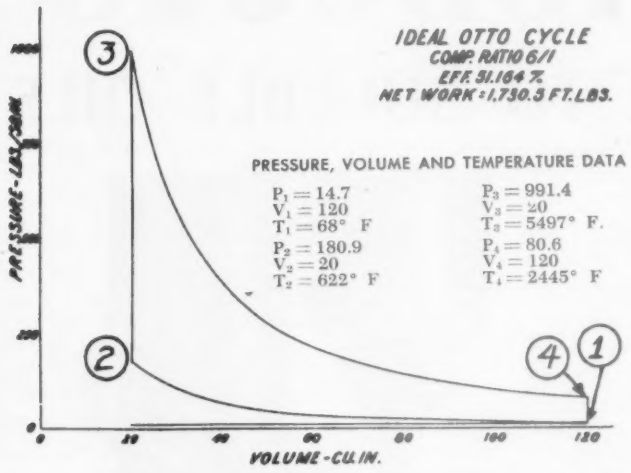
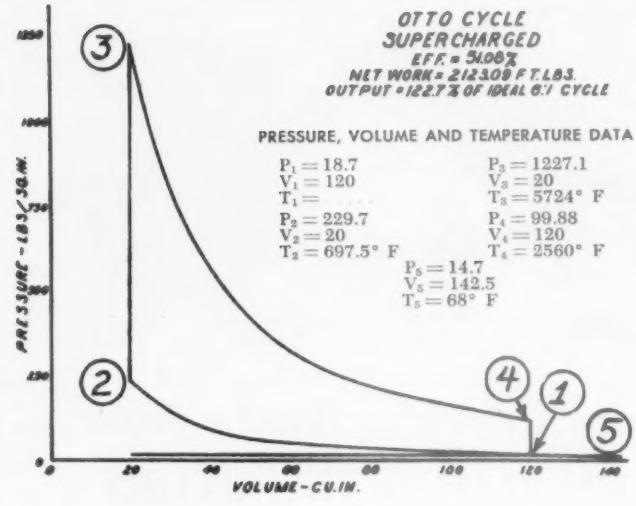


Fig. 10—Ideal otto cycle engine, with a compression ratio of 6:1



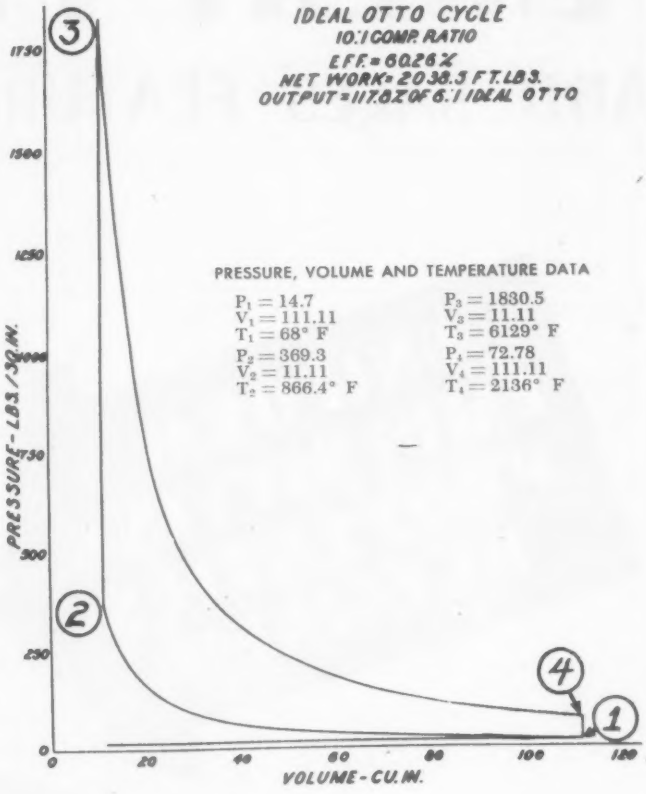


Fig. 11 (above)—Ideal otto cycle engine with compression ratio increased to 10:1, and having an output equal to 117.8% of the 6:1 ideal otto

Fig. 12 (left)—Otto cycle, supercharged but with the 6:1 nominal compression ratio maintained. Here the output is increased to 122.7% of the 6:1 ideal otto

haps the difference in temperatures might also be indicative of the difference in life expectancy of the parts exposed to the flame.

Referring again to Fig. 8 we can see that the octane requirement for a typical normally aspirated engine has a tendency to fall off with increase in speed. We may better be able to take advantage of the typical fuel characteristics of the fuels coming from so many of our refineries both in type and ratio that we may have little boost at the lower RPM's and gradually increasing boost at the speed increases. This would tend to give an engine octane requirement characteristic which would more closely approximate a constant octane requirement.

At the same time this type of boost will tend to increase the horsepower without materially increasing the peak torque outputs so that the entire drive train from the clutch through the transmission and rear axle would not have to be materially increased in strength and correspondingly in weight. Many of the improvements in engine units will have to be incorporated in this engine, for greater durability and ruggedness will be required due to the increased heat which each part must be able to withstand.

More Cooling of Valves, Pistons

Sodium-cooled valves will in all probability be required for the exhaust, perhaps even the intake. Oil cooling of the piston may help to keep it in the correct shape and prevent burning. Necessary even in today's engines, adequate cooling of the valve seats and combustion chamber parts will be even more necessary in this supercharged engine. We must have intake ports designed to get a full charge into the cylinder with the lowest restriction and the exhaust ports designed to get the exhaust gases out into the manifold with as little heat rejection to the water from them as it is possible with normal casting technique.

It is every bit as important that we get the aforementioned good intake port design and good valve lift with the supercharged engine as it is with the normally aspirated engine, for every unnecessary fraction of horsepower that is used in pumping is just so much loss and, therefore, so much inefficiency.

We may confidently expect the engine manufacturers to redesign their engines to take advantage of many of the improvements we know are developed today as well as those still in the development stage.

Fuel in itself as well as its influence on engine design will be the most outstanding contributor to higher efficiency and horsepower output.

Supercharging will be used in those operations and territories which require large power units.

The manufacturers of the various component parts will keep up with and sometimes lead the demands of the engine manufacturer. Economics alone will force this for competition will be keen and "the devil takes the hindmost".

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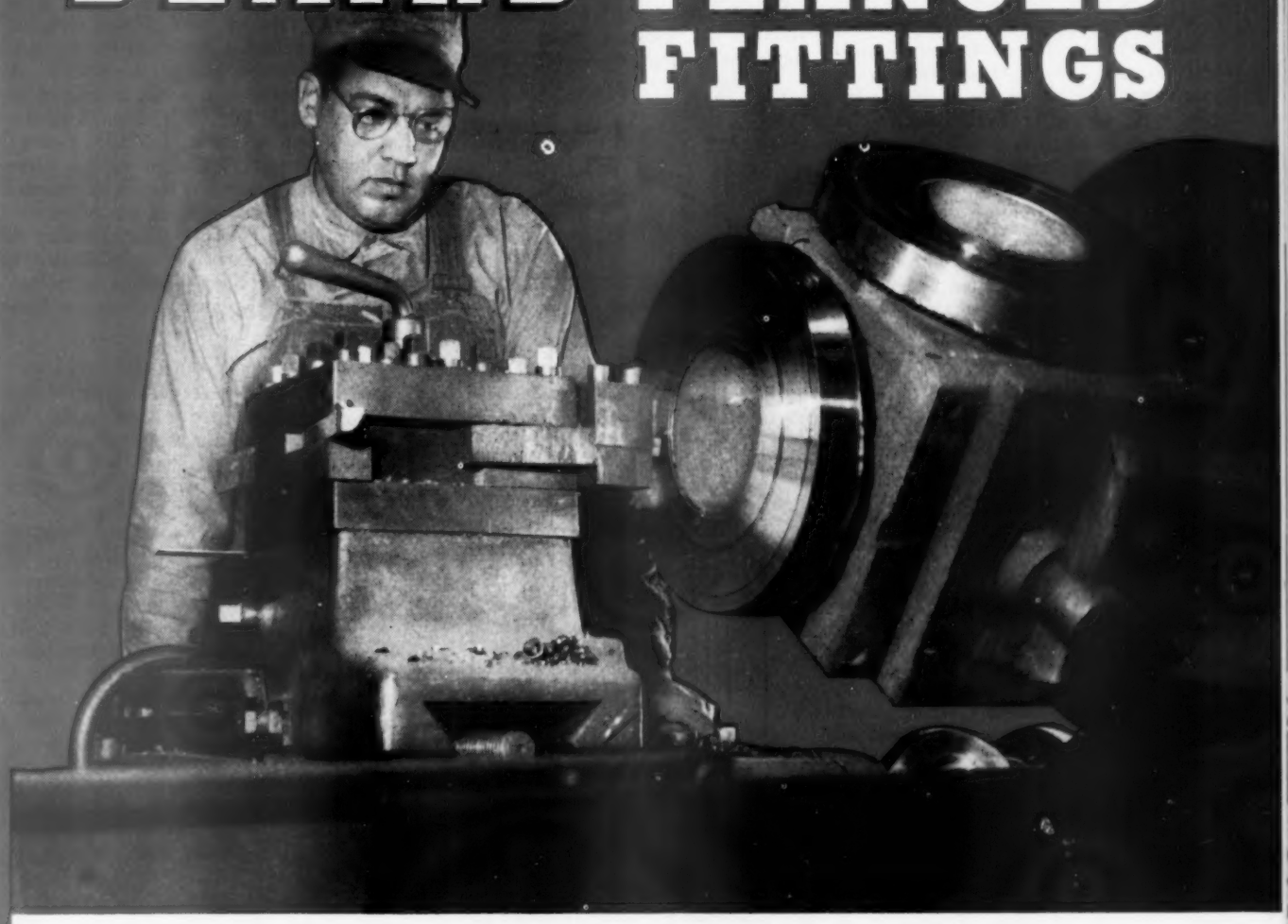

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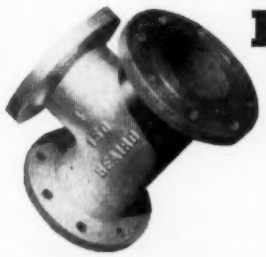

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(*Continued from p. R-336*)

permanent pressure loss at each valve has been negligible.

Another feature of the motor operated valves is the use of steam to seal the gate and prevent leakage of oil into air or vice versa. The valves are of the wedge gate type seating on both sides of the gate. The sealing steam is introduced at the valve bonnet and envelops the gate between the two seating surfaces. In order not to introduce an excessive amount of steam, as when the valve is open, the blocking steam is controlled by a pilot activated by operating mechanism of the main valve. The blocking steam pressure is set about 25 psi higher than the highest operating pressure in the line.

Catalyst Case Design

The design of the catalyst case itself is somewhat of a compromise since it has to serve several functions. This description applies to the type of cracking cases now in use, although improved types are under laboratory and commercial study. Broadly speaking, cooling tubes for the circulation of cooling medium are embedded in the catalyst, and these tubes have heat transfer fins to increase the rate of heat removal. The oil and air are introduced through other tubes extending into the catalyst. Outlet and collecting ports are arranged so that the vapor path is about 30 in. This choice allows the use of the limiting orifice principle for insuring good flow distribution. The pressure drop through each set of distributor or collector bushings is about 13 in. of water or about six times the pressure drop through the bed. Thus any crushing of catalyst, or accumulation of fines in the bed has almost no effect on the vapor distribution.

A horizontal cross section of a portion of the tube pattern is shown in Fig. 7. The air and oil inlet tube or RT is not cooled by the circulating salt, but its temperature does not rise excessively because of the relatively cool vapors flowing through it. On the other hand the collector tubes or DT are welded to the salt cooled tube, which provides adequate cooling. In addition, there are finned tubes for cooling only or KT. The average distance between cooled surfaces is about ⅝ in. Since the heat transfer from the steel tube to salt is very high—of the order of 300-400 BTU/°F./sq.ft./hr.—and the external coefficient from gas and catalyst is limiting, the increase of external surface by the use of fins is very effective.

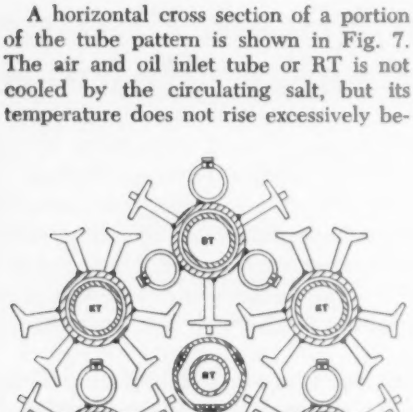

Fig. 7—Horizontal cross section of Houdry catalytic case, showing air and oil inlet tube (RT), collector tubes welded to salt cooled tubes (DT), and salt tubes for cooling only (KT)

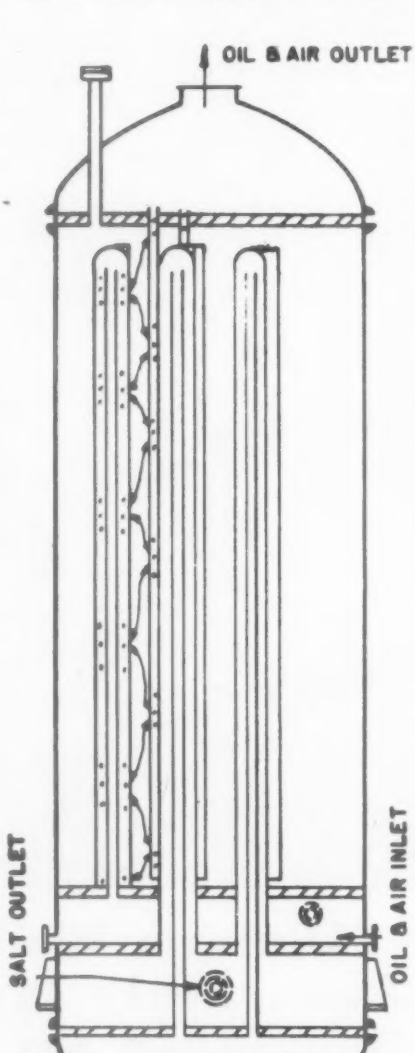

Fig. 8—Vertical cross section of Houdry catalytic case (schematic)

A simplified vertical cross section of the case is given in Fig. 8, showing the flow of salt, and oil and/or air in the case. The insert tubes in the salt and air tubes are particularly to be noted. The air and oil flow is brought in the insert to the far end, and distributed through bushings of alloy steel. In order to keep these bushings from becoming plugged with a catalyst pellet, a shield of alloy steel covers the orifice. The escape area around the edge of this shield must be adequate to prevent excessive back pressure. In practice with 4 mm. catalyst pellets, we find a minimum escape area to be ten times that of the orifice. A typical bushing and shield arrangement is pictured in Fig. 9. The width of the escape slot is about 1/3 the average pellet diameter. The flow up the insert and down the annulus results in equalizing the temperature along the tubes and prevention of hot spots. The transfer of heat from the external tube through the annulus to the inside fluid is controlled by relative flow rates and relative heat transfer areas.

It should be noted that the finned sections are anchored at the bottom of the case. This is necessary because of the lifting action of the catalyst during the cyclic heating and cooling. The tube lifts slightly allowing catalyst to fall down and lock in the manner of a ratchet. When the tube tends to slip downward again, the movement is impeded by the catalyst in compression. This causes considerable stress in the tubes and if they are anchored at the top only, gives such compressive stresses that the top tube sheet is ultimately deformed. By anchoring the tubes at the bottom, the stresses are tension, and are relieved at each cycle without bending or buckling of the tubes.

The necessity for salt flow in and out of the bottom of the catalyst vessel together with the need for introduction of air at this point makes the construction of the bottom of the case somewhat complicated. Three header areas are provided; the upper between the catalyst tube sheet and the main tube sheet is for oil and is sealed from the case area by gaskets. The RT tubes are screwed into the catalyst tube sheet also and the other tubes are rolled into this tube sheet. These closures are not absolutely tight, but are sufficient for the seal between the oil inlet header and the oil catalyst space. However, between the salt header

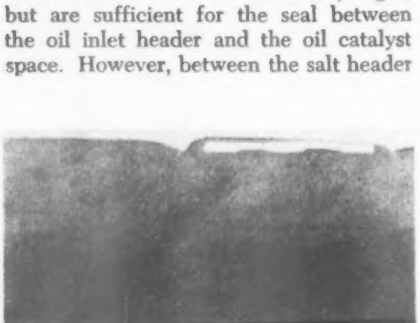

Fig. 9—Shield arrangement to prevent bushings for distribution of air and oil flow from becoming plugged with a catalyst pellet

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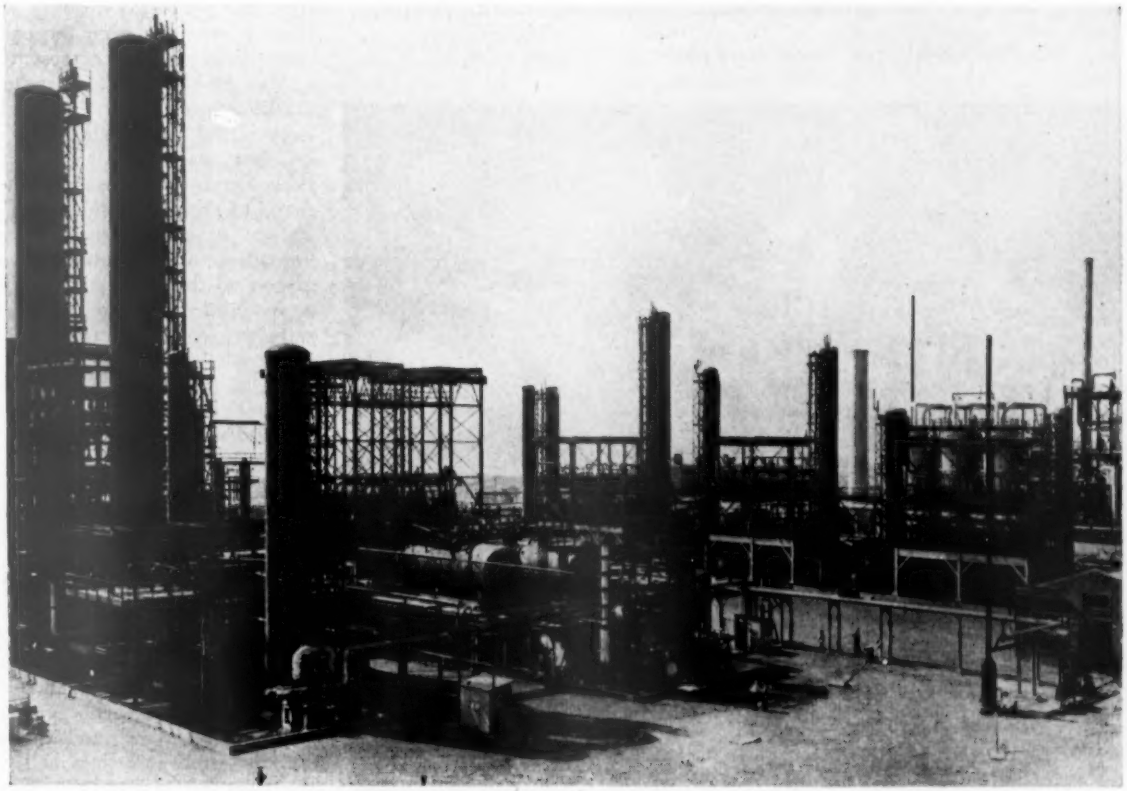

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and oil header a positive closure is required. In this case the tubes are both rolled and welded, and the main tube sheet is welded to the shell. The construction of the bottom of the case is such that the second or main tube sheet takes the load, since there are fewer holes than in the top or catalyst tube sheet.

It is rather difficult to analyze in a simple manner the factors affecting heat transfer within the case. Fig. 10 shows the temperature pattern obtained when burning a deposit amounting to 7 grams of carbon per liter of catalyst—about 1.2% by weight in ten minutes. In this example the average temperature of catalyst at the midpoint between cooling fins is 917° F. over the regeneration period, and the salt temperature is 800° F. The external fin area amounts to 1.2 sq. ft. per liter of catalyst and the average heat of combustion of the deposit for one liter of catalyst for the cycle is 230 BTU. Of this, 79 BTU is absorbed in the catalyst and steel fins by raising their average temperature. Thus an average over-all heat transfer coefficient of 6.4 BTU/hr./°F./sq. ft. is indicated.

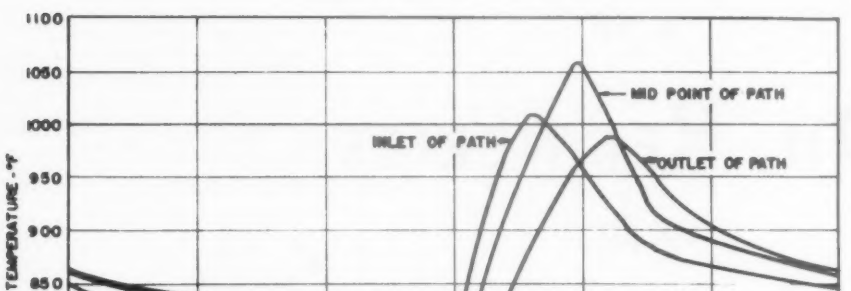
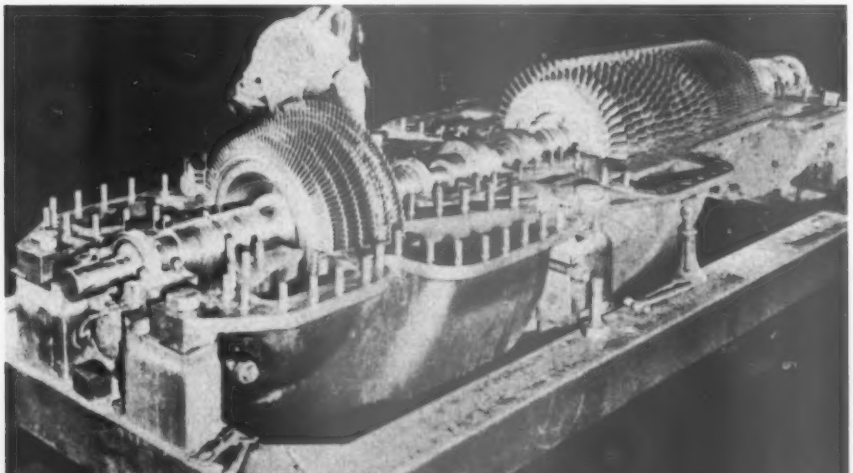


Fig. 10—Typical cycle temperature pattern for Houdry case



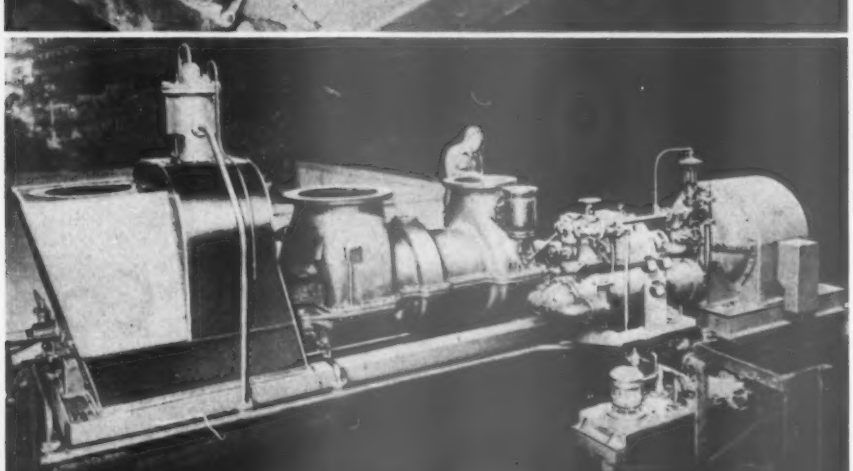


Fig. 11—Axial type turbo-compressor unit used with Houdry plants for power recovery. Above, unit with top casings removed

If the entire cycle is considered the average catalyst temperature is 860° F., and there is no change in initial and final temperature. Deducting the heat of cracking from the heat of combustion gives 213 BTU per liter of catalyst for the cycle of 30 minutes. The calculated over-all heat transfer coefficient for this case is 6.0 BTU/hr./°F./sq. ft. of cooling area. This is made up of conduction from the pellets to the fins, convection between gas and the fins, and radiation from the pellets to the fins. No one of these is controlling for the conditions in commercial use at the present time.

The problem of temperature control at the border of the tube pattern has been solved by introducing a wavesheet or liner inside the actual shell. This liner corresponds closely to the external shape of the finned tubes and limits the amount of catalyst in this area. The limitation of the catalyst controls the carbon so that the heat to be removed is in proper ratio to the salt cooling surfaces. In other words the liner which is uncooled is substantially at a neutral point in the temperature cross section. The liner is made gas tight except at the top, and the space between the liner and the shell is filled with Johns-Manville C-3 high temperature insulation. Care is taken that there is no vapor path through the insulation and that this area is evacuated with the case interior so that bulging of the wave sheet due to external pressure is avoided.

As a further protection against damage to the case shell, cooling coils are usually provided through which salt is circulated. This serves to provide cooling in the event it is required, and also maintains the area between the shell and liner above the dew point of the hydrocarbons, and prevents condensation in the insulation. Such condensation might lead to coke formation and very high localized temperatures during the regeneration period.

Salt Cooling Systems

It is essential that temperatures be closely controlled in the catalyst bed, not only from the standpoint of excessively high temperatures, but also to prevent excessive cooling which would cause condensation of liquid oil on the catalyst and lead to trouble in purging and regen-

TABLE 2—Typical Heat Balance Over Houdry Fixed Bed Cracking Process

	Heat Input		Heat Output	
	BTU/Hr.	%	BTU/Hr.	%
Combustion of Coke	102,150,000	100.0		
Heat Removal by Radiation			5,000,000	4.9
Heat Removal by Regeneration Fumes			3,015,000	3.0
Heat Removal by Oil Vapors			2,360,000	2.3
Heat Removal by Heat of Cracking			6,898,000	6.7
Heat Removal by Salt Exchange				
to Regeneration Air			14,730,000	14.4
to Steam Production			70,147,000	68.7
TOTAL	102,150,000	100.0	102,150,000	100.0

eration. Hence the use of water as a cooling medium was abandoned because it tended to produce cold spots in the catalyst bed. The choice of the cooling medium eliminated organic compounds because of their instability at temperatures of 800° F. and above and finally narrowed down to a molten eutectic mixture of KNO_3 and $NaNO_2$. It has a conveniently low melting point of 284° F. and is stable in the absence of air. The heat transfer coefficients between steel and salt are very good and the salt is non-corrosive toward carbon steel below 900° F. For higher temperature calorized or alloy piping is satisfactory.

Because of the composition of the cooling medium, some hazard is introduced if oil and salt become mixed. However, at operating temperatures, the hydrocarbon vapors burn rather than explode, and with proper precautions no difficulties have been encountered.

The use of this high temperature heat control medium allows the introduction of heat into the catalyst at some portion of the cycle if desired. Also, the high temperature at which it is available and the excellent heat transfer characteristics are very useful in heating the regeneration air and in generation of high pressure steam.

The requirement to prevent oxidation of the salt and also to minimize the hazard of accidental intermixing of salt and oil has presented some special design problems. The salt circulating through the cases is maintained under vacuum to remove any vapors given off and prevent vapor lock in the salt tubes of the case. The vacuum also serves to insure that, in the event of a salt leak, hydrocarbon vapors are drawn into the salt stream, and there is no possibility of salt leaking onto the catalyst which may be saturated with heavy oil and coated with carbon and thus represents a real explosion hazard. By sampling the gases removed by the salt evacuation system, any leak of oil can be instantly detected, and the offending case removed from service for repair. For this check, a portion of the evacuation gas is bubbled through water to condense any oil which shows up as a film on the surface of the water.

Air is excluded from the storage tanks by a blanket of steam to prevent oxidation. When oil leaks are avoided there is no build up of carbonate in the salt, and the rate of oxidation is very slow, so that no treatment of the salt is required. However, accidents do happen, and a number of plants have installed equipment to recondition the salt by removal of carbonate and the reduction of nitrates to nitrite using hydrogen.

The salt system not only serves to cool the catalyst cases, but also provides an excellent source of high temperature heating fluid. It is commonly used for production of 450-lb. steam and for heating the regeneration air to reaction temperature. In some plants, the salt is used for raising the temperature of various oil streams as well. The heat transfer coefficients for various types of equipment using salt as a heating medium are as follows:

	Type	K = BTU/hr./sq.ft./°F.
Salt boiler	liquid—boiling liquid	150
Steam superheater	liquid—vapor	70
Air heater	liquid—gas	5.7
Crude exchanger	liquid—liquid	52-80

Power Recovery

One of the most interesting aspects of the Houdry fixed bed plant to an engineer is the application of a gas turbine to power recovery. In the development of the short cycles which were desirable to provide the desired severity of cracking, it was found that regeneration under pressure was mandatory. The minimum pressure of operation required for efficient combustion was found to be about 30 psig. However, for more efficient turbo-compressor operation, somewhat higher pressure was desirable.

Two views of the turbo-compressor unit are shown in Fig. 11. It is an axial type machine, equipped with low alloy turbine blades and suitable for inlet gas temperatures up to 925° F. Machines having capacities of 15,000, 23,000, 40,000 and 60,000 CFM are now in service. The speed of the 40,000 CFM machine is 5280 RPM.

The power recovery cycle is complicated by the requirement of "stealing" from the compressor discharge the air to repressure the cases prior to regeneration. The fumes from the pressure release at the end of regeneration are not passed through the turbine. Thus, for a typical plant the power balance figures are as follows:

Theoretical power for compression—41,900 CFM @ 86°F. and —6.2 in H_2O to 53.3# gage and 433°F.= 4410 KW.
(Temp. Efficiency=87.0%)

Theoretical power from expansion of all the above fumes from 44.2# gage and 825° F. to atm. and 500° F. =4800 KW.
(Temp. Efficiency = 82.7%)

Theoretical net power generation = 390 KW.

The mechanical efficiency of the compressor and turbine is high, the loss

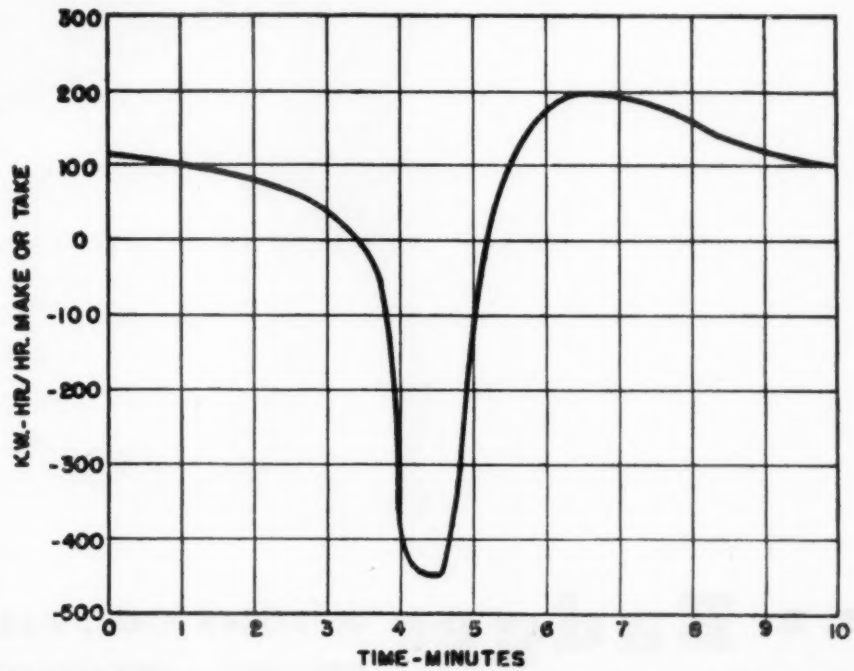
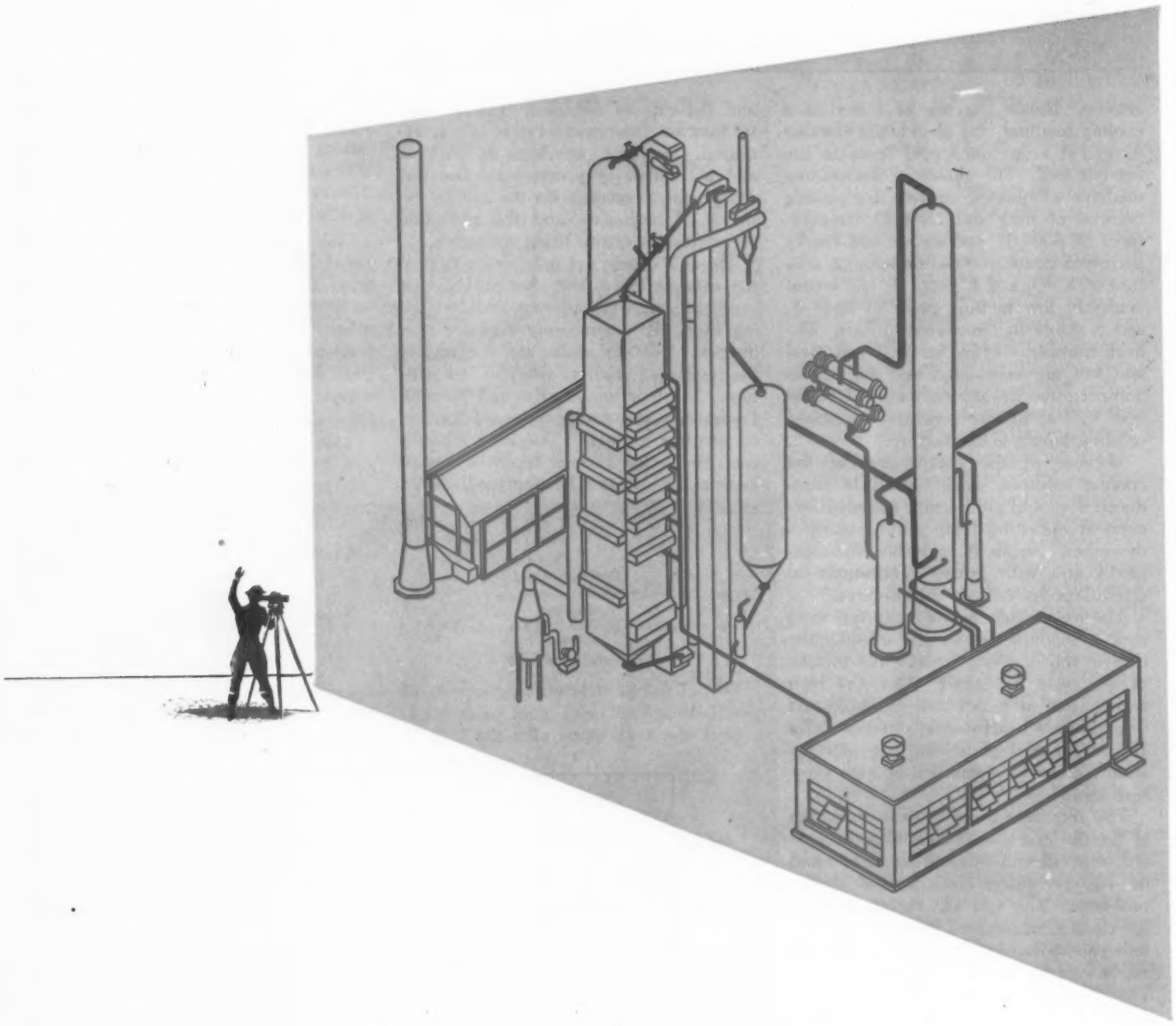


Fig. 12—Typical net power output curve of turbo-compressor used with Houdry plants

THERMOFOR CATALYTIC CRACKING



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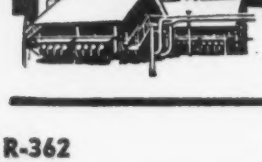

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amounts to about 2% on each unit. Hence the net power generation during the period of steady flow is 206 KW. The power deficit caused by withdrawal of high pressure air for repressuring amounts 450 KW over a period of 1 minute and 30 seconds. Hence the average continuous loss is 68 KW and the net mechanical power delivered to the generator is 138 KW. In an actual test operation of several weeks, the average net electrical power output was 120 KW.

The role of motor-generator unit is illustrated in typical power output curve shown in Fig. 12. The requirement for furnishing energy during the repressuring operation is clearly shown.

Heat Balance

The heat balance for the catalytic section of the Houdry cracking unit is given in Table 2. The system under consideration includes only the catalyst case area. Oil is furnished to this area as vapor at 806° F. and the regeneration air is introduced at 768° F. Thus the heat removed from the salt system in heating the air and the production of steam is external to the system. It is noteworthy that of the heat produced by combustion of catalyst deposit, 69% is used to generate steam and 7% for heat of reaction, giving an over-all thermal efficiency of 76% defined as useful heat recovered.

Conclusion

In the Houdry fixed bed cracking process, the principles of automatic control of a cyclic operation over a bed of pellet catalyst have been thoroughly worked out and proved in commercial practice. The design of the catalyst vessels includes provisions for heat transfer to permit efficient control of temperature for strongly exothermic or endothermic reactions. When one portion of the process cycle is exothermic and another endothermic the range of physical variables which can be employed is very wide and can be made to suit any particular case.

Pressures from 5 ins. of mercury absolute to over 200 psig have been used in this type of equipment, and the wide choice of operating cycles permits almost any degree of severity required. The temperatures at which this type of equipment can be used depend on the materials of construction, with present carbon steel convertors catalyst temperature from about 650° - 875° F. are now being used.

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(3) Prickett and Newton, *Refiner*, Vol. 22, pg. 107, (1943).
(4) Prickett and Newton, *Petroleum Engineer*, Vol. 15, pg. 83 (1944).
(5) Smith and Bland, *Oil and Gas Journal*, Vol. 42, pg. 209 (1944).

Keeping Up With the News

By N.P.N. Special Writer

This series consits of brief, technical-economic digests of several of the current developments in scientific and industrial fields which may relate to the future of the petroleum industry.

Petroleum economics are exceedingly complex. Their consideration reaches into the details of many fields which at first glance may appear only remotely related. Nevertheless, these economics constitute a very real thread of interest which links together the various subjects considered in this issue. These include carbon black, chlorinated paraffins, automobile news, petroleum chemicals, jet propulsion fuels, synthetic ammonia, and a definition of the term, "Synthine."

The author of this series is a chemical engineer in the research subsidiary of one of the larger oil companies. His duties include a continuous survey of the current technical and economic journals in many fields.

Carbon Black

The rubber fabricators and the public which consumes their products have been faced with one crisis after another during the war. First, rubber itself was in short supply, because of Japanese conquests. Then, as synthetic rubber production began to close the gap, came the problems attendant with using an entirely new substance. Now that these have largely been overcome, it appeared that the sailing ought to be relatively smooth—but unexpected military demands coupled with mistakes in overall planning have again occasioned a crisis.

Synthetic rubber production itself must be increased—by 31% this year, over the 1944 production of 763,255 long tons, to a goal of 1,200,000 tons in 1946. Rayon will be in short supply for tire cords, and its production facilities may have to be increased again. The prime deficit, however, will occur in supplies of carbon black, a substance even more vitally needed in the compounding of Buna-S (GR-S) than with natural rubber.

A 6:00 x 16 synthetic rubber tire, for example, requires 4.5 pounds of carbon black if its quality is to be comparable to one made of natural rubber which contains only 3.25 pounds of carbon black. Carbon black supplies are now so low, however, that WPB has ordered the former amount reduced to 3.75 pounds per tire, while passenger car tire production has been cut to 1,000,000 tires per month. Both are part of WPB's program to reduce the use of carbon black by 10,000,000 pounds per month.

WPB has estimated that the present deficit in carbon black production approximates 15,000,000 pounds per month. New facilities designed to produce an additional 405,000,000 pounds per year are lagging behind construction schedules. Even when these are completed later this year, there may be a 1945 shortage of around 260,000,000 pounds. The 1946 deficit might reach as high as 350,000,000 pounds.

Many steps have been taken to alleviate the present shortage. According to present plans, carbon black output will be increased from the 80,000,000 pounds monthly level current in March to 85,000,000 pounds in April and 98,000,000 pounds monthly by July. Even that production rate falls short of the industry's 1945 requirements of 1,255,000,000 pounds (over 100,000,000 pounds per month) and leaves no provisions for exports (to be cut 5,000,000 pounds per month) or for building up working inventories. An eventual production increase of 64% is said to be planned, chiefly from numerous entirely new plants and many plant additions.

WPB's new program also includes: (1) Release by PAW of 10,000 barrels daily of naphtha and 2,000 barrels of natural gasoline residue, to increase carbon black production 1,500,000 pounds per month; this increase will not be realized at once, however, because of new machinery requirements. (2) Release by PAW of 150,000 gallons of propane daily, which will step up carbon black production by more than 1,000,000 pounds per month; as soon as the heating season is over, PAW will provide another additional 150,000 gallons daily. (3) WPB has received a 30-day emergency waiver for the use of "sweet" gas at several Texas "furnace" carbon black plants, which will increase their output by 1,500,000 pounds per month. During this waiver period, it is hoped that means will be perfected of enriching the so-called "sour" gas at several furnace black plants, so as to increase their output by 40%.

It is interesting to note that four of the projects approved by the WPB are to be constructed by the Phillips Petroleum Co. Three call for additional equipment rather than actual plant construction, but the fourth, to cost $260,500, is for an "addition" to Phillips' plant at Borger, Texas, which will result in the production of 16,000,000 pounds of carbon black per year. Phillips is known to have a carbon black plant at Borger which uses "degraded oils" as raw materials, instead of natural gas. Two new projects were assigned to the Cities Service Oil Co., but details are not available on these projects.

The petroleum industry has several points of interest in the carbon black situation. First of all, its allied product, natural gas, is the chief raw material. Secondly, processes are being developed (and evidently used to some extent) to produce certain types of blacks from petroleum residues or other less valuable products. Finally, the industry, in peacetime at least, depends upon the sale of automotive fuels for the greater part of its income. Unfortunately, these sales may be unduly restricted for some time after the war if a shortage of carbon black continues to limit quantity (and quality) production of synthetic rubber tires[1].

Chlorinated Paraffins

The literature is beginning to record an increasing amount of data on the properties and uses of chlorinated paraffin waxes, formed by the substitutive action of chlorine upon paraffin waxes under carefully controlled reaction conditions. The general properties and uses of the substances were described in an excellent article last year[2], and an even more recent note[3] gives some further details.

This latter article states that while chlorinated paraffins are not new, "it was not until World War II that large-scale production of 70% chlorinated paraffin was achieved." The standard grade most used heretofore contained 40-43% chlorine, while the next most used grade contained about 60%.

"The advantages of increasing the chlorine content to 70% are said to be as follows: the material obtained is a resinous solid; it is somewhat more

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(1) Statistics in this section taken from *Business Week No.* 810, 74; No. 811, 19; No. 812, 21 (1945), and *Oil, Paint and Drug Reporter* 147, No. 14, 4 (1945).

(2) Scheer, W. E., *Chemical Industries* 54, No. 2, 203 (1944). "Properties and Uses of Chlorinated Paraffins."

(3) Lee, J. A., *Chemical & Metallurgical Engineering* 52, No. 3, 137 (1945), "New Products and Materials—Chlorinated Paraffins."

stable; it is compatible with a very large number of film-forming materials and can therefore be combined to produce fire resistant films; and, finally, its potency as a flame retardant is considerably greater than that of the liquid paraffin[3]."

Some 90% of the production of this type of chlorinated wax is being used for the treatment of cotton duck for army tents, because of its ability to impart flame res.stance; other grades are also used for this and similar purposes. The chlorinated wax alone "is not considered sufficient to give adequate flameproofing and must be mixed with other materials (resins, antimony oxide, calcium carbonate, pigments, fillers, etc.) to form a suitable impregnating composition. . . . The cost of coating 11-12-ounce cotton duck for tentage with a finish based on chlorinated paraffin on a large scale is about 9-10 cents per yard[2]." Duck so treated is more durable than that using the chrome and iron finish formerly in use.

Many of the other proposed applications of the 70% chlorinated paraffin make use of its ability to impart flame resistance. These uses include linoleum, electric cable coatings, and lacquers and similar coatings.

The chlorinated paraffins in general are said to have the following major uses at present: fabric impregnation; use as plasticizers; incorporation in fireproof, corrosion-resistant, and other special paints; and use as lubricating oil additives. In the latter case, certain types are excellent "extreme pressure" agents and are much in use, since they are "the most inexpensive oil soluble compounds available with high chlorine content[2]." Another type of lubricating additive, an excellent pour point depressor, is synthesized by condensing a chlorinated paraffin with an aromatic hydrocarbon such as naphthalene.

Many other uses exist, and others will be found in the future. Synthetic lubricating oils have been prepared abroad by the condensation of chlorinated waxes (especially those from the Synthine process) with naphthenes, aromatics.

Automobile News

As the war in Europe approaches its conclusion, more attention is being given to the resumption of automobile manufacture. WPB has taken the position that this resumption cannot be permitted to jeopardize war production, and the automotive industry has agreed wholeheartedly; but these official statements do not disguise the fact that both industry and government are considering the problem from every angle.

There is said to be little prospect that the average driver will be able to get a new automobile before 1947, since, even if the German war ends in the near future, it probably will be mid-1946 before cars can be produced in any number. In addition, the first several hundred thousand of these probably will be rationed to those whose needs are greatest. WPB is reported to have given thought to producing a "victory model" if it appears that production of automobiles by the industry as a whole cannot begin in time to avert a breakdown in transportation. "This idea is not popular in the industry[4]."

Rumors concerning postwar models continue to attract attention. "The much-rumored Henry J. Kaiser postwar auto is under wraps but is very much a live subject according to executives who have seen it and ridden in it at the Fleetwing plant, Bristol, Pa. The experimental models are equipped with 76 HP Continental motors; each wheel has two 4½-inch coil springs for superior riding qualities; three people can be seated comfortably in the front seat. Much of the car is constructed of aluminum and magnesium for light weight and consequent low operating cost. Prices and sales plans are still a mystery, but Kaiser's goal is said to be a new low in initial cost, combined with a real bargain in low operating cost[5]."

"The end of the war will not mean the end of automobile rationing and price control," according to Ray Chamberlain, executive vice president of the National Automobile Dealers Association. The demand for cars will so far exceed the supply that the government will be compelled to continue these measures for some time after peace comes, he points out in a bulletin made public recently.

"When we reach the place in the war's progress when the resumption of automobile manufacture can be considered expedient by the government, the industry will probably start production at the rate of approximately two million cars a year," the bulletin says. "This probably will be stepped up quite rapidly because both competition and demand will be unprecedented. By the end of the first year, the factory people probably will be turning out cars at the rate of 3.5 or 4,000,000 a year. This stepping up process will continue into the second year after production is resumed, and I believe the industry will produce at least 5,000,000 automobiles during that year. This would put production above the average in the most active prewar period. The third year after car-making starts again, production will in all likelihood go as high as 6 and possibly 7,000,000 units. I think that will be just about as high as annual production ever will go for a long time.

"It is obvious that the production figures I have given will fall far below the number of cars that the public will want just as soon as the industry gets the green light. For example, there are approximately 24,000,000 passenger automobiles on the streets and highways of the U. S. at this time. Broadly speaking, every one of these cars will represent a replacement demand. It will take the manufacturers more than five years, in round numbers, to supply this demand alone. And in the meantime, many new buyers will come into the market, to say nothing of the enormous number of returning soldiers who will want cars and who will stand at the top of the priority list[6]."

Petroleum Chemicals

According to *Chemical & Metallurgical Engineering*[7], the following chemical quantities were produced from petroleum in 1944: isopropanol, 75,000,000 gallons; ethylene glycol, 12,000,000 gallons; methanol, 3,000,000 gallons; and methyl ethyl ketone, 10,000,000 gallons. More than 7,000,000 tons of synthetic organic chemicals were said to have been produced in 1944, compared with 6,200,000 tons in 1943, and more than 5,000,000 tons of the 1944 production consisted of noncoal-tar (noncyclic) chemicals. About 25% of the country's supply of butanol is also said to have been produced from petroleum constituents last year, and it is believed that acetone production (which comes largely from isopropanol) will approximate 385,000,000 pounds in 1945.

These chemicals are but part of the increasingly large number of chemical derivatives of petroleum. It will be interesting to see what the whole picture looks like when the veil of wartime censorship is lifted.

Jet Propulsion Fuels

Recent announcements attest to the rapid development of a new phase of petroleum fuel research—that of jet propulsion fuels. Such research is, of course, very necessary, for the type of combustion involved is radically different from the better known forms, and basic data are required to provide the best types of fuels. In addition, the petroleum industry will, as usual, be in a position to make important contributions to the design of combustion chambers, both as regards jet propulsion and combustion turbine engines.

One of these announcements concerns the laboratory which the Shell

(4) Anon., *United States News* 18, No. 13, 24 (1945), "Approaching Auto Crisis."
(5) Anon., *Modern Industry* 9, No. 3, 110 (1945), "Kaiser Automobile a Reality."
(6) Anon., *Automotive and Aviation Industries* 92, No. 6, 108 (1945).
(7) Anon., *Chemical & Metallurgical Engineering* 52, No. 2 (1945).

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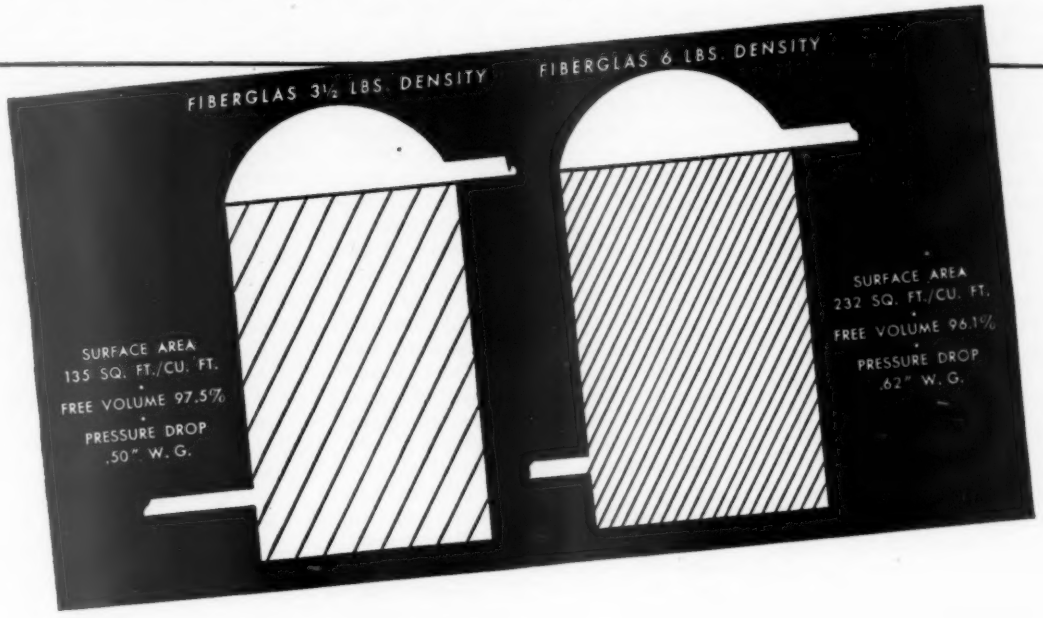

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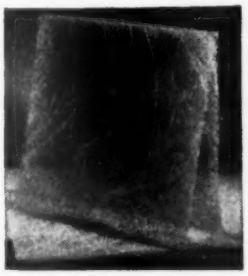

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Oil Co. has put into operation at Wood River, Ill. Here research is underway as a complete, full-scale operation, using a jet burner whose details cannot yet be revealed. Experimental apparatus for further research is also being developed, and Shell engineers are said to feel that the combustion turbine (or gas turbine) has an important future in the field of prime movers. According to reports, they feel that the jet propulsion engine may find postwar application in aircraft in combination with a combustion-turbine-driven propeller.

The Texas Co. has also revealed that it is producing special fuels and lubricants for turbo-jet engines, motive power for jet-propelled fighter aircraft. The fuel is described as a very narrow boiling range petroleum fraction, "somewhere between kerosine and gasoline in nature," and the lubricants must perform satisfactorily in a temperature range from —90°F. to 250°F.

Additional developments may be expected, since many petroleum companies are certainly involved in a consideration of problems of such present and future importance.

Synthetic Ammonia

This topic was discussed a few months ago in some detail[8], but a somewhat startling news development has put a different light on the subject. Diplomatic maneuvers, it would seem, will effectively settle the puzzling economic problem of what to do with the numerous government-owned ammonia plants (using hydrogen produced from natural gas) which have been built during the present war.

According to a report of a State Department release[9], "the government has promised Chile that it will discontinue commercial operation of its synthetic nitrogen plants after the war to prevent competition with the Chilean natural nitrates industry." In a commitment made in March at the Mexico City conference, "Secretary of State Stettinius told Chilean officials that this country intends to keep government-owned plants in operating condition to insure domestic security but that they will be used only for scientific research and technological experiments."

Chile is to be notified if this decision is modified. It is also to be advised "if the government decides to sell synthetic plants to private interests in the event such sales would create serious problems for the Chilean industry." The State Department has indicated that "many of this nation's government-owned plants will be dismantled or converted to other uses as soon as war needs diminish."

Senator Taft of Ohio has questioned the State Department's authority to make such commitments, stating that he was assured by the Senate delegation to Mexico City that no agreement had been made.

Others will also challenge this agreement, for it has ramifications which reach far beyond the nitrogen industry. If it were placed in effect, there would seem to be no reason why such an industry as that for synthetic rubber production might not be similarly wiped off the map through an agreement with Great Britain and the Netherlands.

In regard to the synthetic ammonia industry, it would appear that the agreement is a senseless effort to turn back the clock of technical progress. If synthetic ammonia is really cheaper to use (and it evidently is) than Chilean nitrate, nothing short of government decree (based on some as-yet-unpassed law) will prevent private industry from building additional plants if it cannot purchase surplus government plants. Nor will the existence of these surplus plants pose a potential threat for long, since technical progress will render them semi-obsolete in a period of a few years.

There is always the question, of course, as to whether these "surplus" plants are really needed, and the ammonia industry appears to doubt that they will be[8]. Nevertheless, the method chosen to deal with the situation is hardly one which is consistent with sound technical practice, and it seems certain that more will be heard on this subject.

Synthine Defined

The petroleum industry has been treated to a welter of new terms in recent years, as technical process followed technical process, but seldom before has it become interested in a technology more replete with duplicatory and confusing terms than it has in the case of the Synthine process.

This process, technically, involves the catalytic hydrogenation of carbon monoxide at low or medium pressures to yield a petroleum-like group of hydrocarbons. It had long been known that the hydrogenation of carbon monoxide at high pressures and over specific catalysts yields methanol (this being the current method of synthesis) or, under somewhat different conditions, other oxygenated compounds or methane; but the research in Germany of Franz Fischer and Hans Tropsch, announced in 1926, showed that, at low pressures and over catalysts of the "iron group" of the Periodic System, predominately hydrocarbon materials could be obtained. Accordingly, this hydrocarbon synthesis began to be called the "Fischer-Tropsch process," and this name has persisted until comparatively recent years and is still in use to some extent.

Abroad, this synthesis depends chiefly upon coal for the preparation of the required "synthesis gas" ($CO + 2H_2$). For this reason, it was fairly logical that the hydrocarbon products from the process should be given the coined name "Kogasin," derived from the German words for coal, gas, and gasoline (Kohle-gas-benzin). "Kogasin I" was the title applied to the naphtha fraction (boiling from 30-200°C.), while the term "Kogasin II" was used for the heavier hydrocarbon products (gas oils, Diesel fuels, etc.).

As mentioned, it was known that higher alcohols and other oxygenated compounds can be obtained from carbon monoxide by high-pressure synthesis, and the term "Synthol" became attached to this particular process. By way of analogy, therefore, it was only natural that the terms "Fischer-Tropsch process" or "Kogasin process" should be given a third synonym, "Synthin," and it is this term, Anglicized to "Synthine," that has lately come into widespread use in this country. It is obvious, of course, that "Synthine," in its American and German sense alike, is a contraction of the words "synthetic" and "gasoline" (or "benzine"), and the term has been properly accepted as both descriptive and convenient. Even further derivatives have been used in certain quarters, such as the word "Synthinate" to describe the product of the "Synthine" process.

Confusion still abounds, however. One prominent engineering concern has recently announced the commercialization of a "Synthol" process which clearly involves the production of petroleum products.

It is possible, of course, that the term is correctly applied, since hydrocarbon products can be prepared from the oxygenated derivatives of this process by dehydration to olefins followed by such steps as polymerization and hydrogenation, but it may simply be a term carried over from early research by the company in question. A recent announcement[10] however, indicates that some oxygenated compounds are possible chemical by-products of the process. Not enough chemical details have been released to clarify this point.

In any case, it appears that the use of the term "Synthine" is becoming well associated with the many variations of the hydrogenation of carbon monoxide to hydrocarbons. It certainly is a better term than such an awkward (and not sufficiently inclusive) title as the "indirect hydrogenation of coal."

[8] Anon., NATIONAL PETROLEUM NEWS, *Technical Section* 37, No. 6, R-132 (1945), "Keeping Up With the News—Synthetic Ammonia."

[9] Anon., *Wall Street Journal CXXV*, No. 79, 7 (1945), "U. S. Reassures Chile on Postwar Output of Synthetic Nitrogen."

[10] Ryan, P., NATIONAL PETROLEUM NEWS, 37, No. 14, 36, (1945), "Ryan Gives Details on New Process Converting Natural Gas to 75 Octane Gasoline at 5c a Gallon."

War's End Will Not Terminate Shortage Of Scientific Manpower for Oil Companies

By D. P. Thornton, Jr.
Assistant Editor, NPN Technical Section

ONE of the most serious problems facing the petroleum industry today is the lack of properly-trained research and technical operating personnel—a lack which will make itself felt for a long time. Oil companies and all other industries alike have been ruthlessly and short-sightedly stripped of their military-age chemists and engineers, and have had to loan or lose many of their older men as well. College training of technical replacements is down to a new low, since the youths who would be studying for these professions in normal times have been taken into the armed services.

Unfortunately, the effect of these losses will not be confined to the immediate period of hostilities, although it is possible that some of the technical men will be released within a short time after the war ends. Many technically-trained men inducted into the armed forces have not been used in capacities utilizing their training. The major portion have gone into combat or have duties with no parallel to their peacetime work and the percentage of those inducted which will return fit for immediate resumption of their peacetime professions is open to speculation.

The Truman Committee of the Senate conducted a survey on this subject the results of which have been only partly released but they indicate that about 90% of the cases investigated showed partial or total waste of valuable technical training, according to Trytten,[1] of the National Research Council. However, he says, in fairness to the services this figure may be unduly large and it should be remembered that the military deal more with the finished product than its development; hence need more maintenance men and operators than research investigators and designers.

This, however, cannot be regarded as an excuse for the failure of the nation's planners to set up some sort of workable system to protect our investment in highly-trained men. A number of educators, in commenting on this country's short-sighted policy with technological manpower, have declared that, as a result, the probable 1945 class of candidates for Bachelor's, Master's, and Doctor's degrees in chemistry, physics and all types of engineering each will be no more than 10% of "normal". Since in the past it has taken from four to six years as a minimum to train research-grade personnel, the prospect is for only a trickle during the immediate postwar period. These educators also forecast an increase in demand for trained personnel in exploiting war-borne discoveries and techniques.

Graphical representations of this trend, based on the number of candidates granted doctorates in various technical fields since 1913, have been prepared by Trytten[1]. Two are reproduced here by permission.

It will be noted in the curve for "physics" (Fig. 1) and in the one for "chemistry" (Fig. 2) that the impact of World War I is clearly discernible. Also the fact that the "loss" of Ph. D. candidates was not compensated for by an above-normal granting of degrees upon cessation of hostilities and disbanding armies of occupation. Few men whose educational careers were then interrupted by the call to war returned to college to complete their education.

The impact of World War II also is clearly apparent. If the experience following the first war is any criterion, the dashed section of the curve is valid in direction if not in slope and it may be 1960 or later before "normal" is attained.

Industrial research, petroleum or otherwise, cannot afford to hold up its program until properly qualified material is available from the professional schools. Thus, in the opinion of technical directors with whom this subject has been discussed, the prospects are for a "mad scramble" to recruit research personnel from returning servicemen now possessing varying degrees of technical education and experience.

At the same time good prospects will be snapped up from the colleges as fast as they are turned out. This does not mean that every chemist or engineer who graduates will be able to dictate his conditions of employment. Many research organizations are not interested in a man having less than a master's degree, and prefer those with doctorates. However, it will mean that salaries of the "good prospects", who have both training and experience, will be higher than in the immediate pre-war days.

Prospects For Oil Research

The prospects for finding "idea" men competent to carry on petroleum research for two to five years after Japan is smashed are nearly as dreary as today's eventuality. Oil companies will have to stretch present expedients to cover this gap. It may be necessary to shut down all but the most promising avenues of research and development until qualified manpower becomes available. That is the opinion of many oil company research directors.

While postponement of much long-term research is an unpleasant prospect, there is no need to lose everything, these authorities believe. For one thing, a careful survey of each research organization may bring to light many inefficiencies which normally would have been tolerated or even unnoticed. The "idea" men can be kept concentrating on ideas and do less actual laboratory investiga-

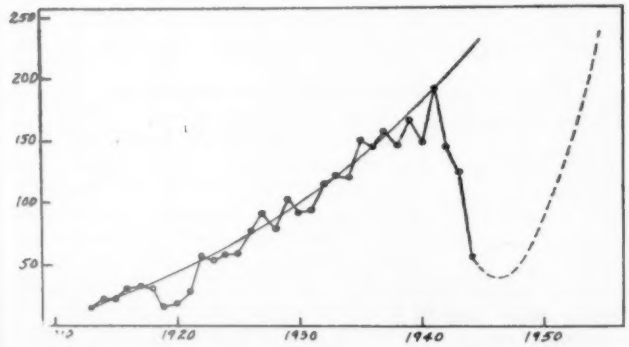
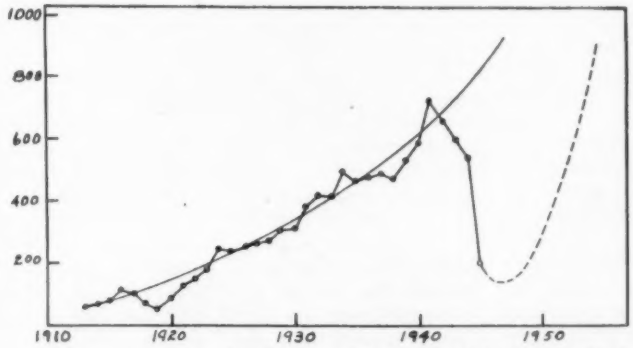


Fig. 1—Number of doctoral degrees granted in physics since 1913, showing the continuing drop which will take place in the immediate postwar years



(Reproduced by permission of *The Scientific Monthly*.)

Fig. 2—Number of doctoral degrees granted in chemistry since 1913, showing the postwar trend

tion in person, through the use of more technicians.

This idea now is being used in several research laboratories. The practice is to see to it that each qualified research man (possessing a master's or doctor's degree and the appropriate practical experience) is provided with all the technological help he possibly can use efficiently. Men and women who possess high school educations or have not completed their college work do the actual "pick-and-shovel" work of the investigation under the supervision of the research man responsible for the development. This leaves the highly-trained man free to concentrate his entire time on the administrative and planning end—the work for which he is of most value.

Such procedure may help uncover potential research personnel, also. As one research director put it, very few "ideas" are conceived or developed by those whose educational training is below the master's or doctorate level. If the unusual occurs, then in his opinion that person should be encouraged to complete his education, so his work will be really productive.

Research Fellowship Suggested

Another possibility suggested for the oil companies is to transfer some of the "fundamental" investigation into the universities. This could be done through the establishment of research fellowships at one or more universities. Such a practice will have the added benefit of permitting the university to add to its equipment and thus make itself still more valuable in industrial research and as an institution of learning, while at the same time assisting to relieve industry of a part of its research burden.

Several industrial research foundations have been doing such work for the oil industry in the past few years. To name a very few: Armour Research Foundation, Institute of Gas Technology, Mellon Institute of Industrial Research. One of the newest to be formed, for service to industry in the midwest, is the Midwest Research Institute, Kansas City. This group expects to consider all types of industry in the area, although no investigations into the oil industry's problems has been announced to date.

It is not believed there would be legal barriers to the formation of co-operative fellowships to perform fundamental research along many lines, the endowments for which are apportioned among one or more oil companies and the benefits accruing to the same companies. The determination of thermodynamic and other physical data on crude petroleum and its products, or new engine tests of new lubricants or additives, by such a group could not be construed as violation of anti-trust laws because the results are not patentable, authorities state.

It would also seem possible that development work on new analytical techniques and instruments, which would be of value both to the oil industry and the public, would not be considered as an illegal combination, if carried on by a group of oil companies.

Another possibility, although one which may cause complications, is the suggestion to import qualified research men from other countries. Several of the countries of Europe not overrun by the Nazis, as well as England, reportedly have not gone so far in stripping themselves of highly-trained men for their armed forces as has been the case in this country. Also, university study is said to have not been so severely curtailed. The extent to which such men will be available in this country depends on the policy of their native countries in keeping them at home for rehabilitating their own war-devasted industries.

Some companies have had their own programs of refresher courses for several years, in which promising men are given instruction by the company's own technical staff. There are, however, two sides to the argument of its value as an expedient to relieve the present and coming shortage of technical manpower. Proponents argue that the men are already "accepted" by the company and their fellow-workers, hence can be readily trained along the lines desired by management.

Opponents argue that such courses are no substitute for advanced university work and that furthermore, the teaching of this group is in itself another demand on the time of the very men of which there is the most lack.

Other companies in the past have permitted their men to work part time, the balance of their time being occupied in formal university training or "refresher courses". While this eliminates the objection of requiring the company itself to furnish a highly-trained instructional staff, still it actually will lengthen the time required for a student to complete his training. It, therefore, is regarded rather as a good way to assure a flow of future research grade manpower than as an immediate source for them.

Discussion of the problem with educators brings no hope of a streamlined method in the schools for producing highly-trained chemists, physicists and engineers in a shorter period than in the past. There have been wartime advances in methods of instruction used by the armed forces, but it is not believed that they can be adapted to teaching the highly technical sciences.

One educator said it is possible to speed up the first two years of undergraduate work to some extent, but there is little hope of speeding up the last two years and still less hope for shortening the period for postgraduate study. His school has experimented with 12 months' schooling a year instead of nine and found the results disappointing. Failure was ascribed to insufficient time for proper absorption of knowledge rather than the students' "going stale" for lack of a vacation from study.

One oil company research director warns specifically against any "quickie" educational program, contending that what is needed are research men and not technicians. Most of the technician's work can be taught him within a few months—even the most exacting laboratory techniques—but he still will not reach research caliber in that time.

Another way of aiding the schools in their job of supplying qualified scientists for future research would be for industrial concerns to discontinue the practice of "robbing colleges of highly-trained men on their teaching staffs. Granting that the teaching profession may be underpaid according to industrial standards, the way to keep these financially satisfied is to make use of their talents as paid consultants, and to give them fellowships, but still keep them teaching.

Summary

It would appear there is not a great deal that the industry can do to immediately provide itself with needed technicians to make up for the present shortage. This shortage may be expected to continue for probably not less than two years after all hostilities have ceased. After that time, there will be a gradual increase in qualified research personnel although it is anybody's guess as to when supply will equal demand.

Each oil company should study its own research organization to the end that each of its research-grade men concentrates the major part of his attention on development and supervisory tasks and does the absolute minimum of "pick-and-shovel" work. Technicians for the latter work, while perhaps scarce now, can be trained with relative ease for most laboratory work.

Returning servicemen probably will not have been engaged in work tying in with their peacetime research or development jobs, hence will need some reorientation (company or university-sponsored "refresher" courses) and time to bring themselves up-to-date on technical advances made during their period of military service. Also their release from the armed services may not come immediately upon cessation of hostilities.

Industrial research organizations can be entrusted with some oil company problems, and establishment of university fellowships as well as retaining educators as consultants will help absorb some of the load from the oil company research and development staffs.

There is no "streamlined" method of quickly creating research-grade manpower. It still will take six to eight years for a high school graduate to acquire a doctorate. It is impossible to forecast with accuracy when there will be enough highly-trained college graduates (master's or doctorate) to supply the demand: it is probable that postwar demand will be higher than ever before.

References

(1) Trytten, M. H., "The Impending Scarcity of Scientific Personnel," *Sci. Monthly*, 60, No. 1, pp. 37-47 (Jan., 1945).

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Petroleum Technologists in the Armed Forces

Technical knowledge and experience along many lines in this war is vital to the success of military operations. Many of the refining technologists of the oil companies in the Armed Forces are serving where their training and experience in the manufacture and utilization of petroleum products are being effectively used.

NPN Technical Section has secured information on some members of oil company technical staffs now in such positions. In many cases the work of these men is of a confidential nature and nothing can be said regarding it. For a few companies, brief sketches on a few of their men serving in technological positions in the Armed Forces are given below. Similar information on men in other companies will appear in later issues.

The Texas Co., Beacon, N. Y., Lab.

Ensign Robert J. Agnew is attached to U. S. Naval Engineering Experiment Station, Chemical Laboratory, Annapolis, working on projects pertaining to lubricating grease analysis and evaluation. He joined Texaco as a chemist at Port Arthur in 1938, after graduating from Cornell University with a degree in chemical engineering. A year later he was transferred to the Beacon Laboratory, leaving to join the Navy in 1943.

Lt. Edward L. Cole is an inspector of petroleum for the Navy, attached to the Office of Inspector of Naval Material, Houston. Graduating from R. P. I. in chemical engineering in 1936, he joined the Beacon Laboratory as a chemical engineer, remaining until 1943.

Colonel Carl E. Cummings is serving with the Area Petroleum Service in England, on a committee with British representatives for petroleum supplies available to the Armed Services. A graduate of Northwestern University and Johns Hopkins in mechanical engineering, he joined Texaco in 1923 and was supervisor, Engineering Research Dept., at the time he left for Army duty in 1941.

Lt. Leon Donn is presently checking instruments on ships for the Navy, attached to the Degaussing Section, San Francisco. A chemist with American Car and Foundry Co. previous to joining Texaco in 1932, he graduated in chemistry from Cooper Union Night School of Engineering in 1938 and was granted military leave in 1943.

Major Louis E. Endsley, Jr., is with the Quartermaster Corps in charge of automotive equipment; previously he had been on loan to the Army since 1939 for work at Wright Field, going on active duty early in 1942. He joined at Beacon as a mechanical engineer in 1936, after receiving a master's degree in mechanical engineering from Purdue University.

Lt. Parvin L. LaTour is with the Navy's Bureau of Ships at Washington, serving as "Liaison Officer between committees and in charge of petroleum test standardization." He was first employed at Port Arthur in 1929, after graduating from Rice Institute, and transferred to Beacon in 1931.

Lt. Com. Neil MacCoul is now stationed at the Navy Air Station, Lakehurst, N. J. as engineer consultant on the Admiral's Staff for fuel and lubrication problems of blimps; he also is connected with the Department of Engine Design and Application for lighter-than-air craft. Commander MacCoul entered the employ of The Texas Co. in 1919, enlisting in the Navy in World War I to serve in foreign waters, and rejoined the Navy in 1943. He holds an M.E. degree from Columbia University.

Lt. Com. Charles G. McIlwraith is stationed at the U. S. Naval Mine Warfare Test Station, Solomons, Md., in charge of a large group of scientific mine personnel doing research on mine warfare. He received a doctor of philosophy degree from New York University in 1928 and was employed by the Bureau of Standards before joining Beacon Laboratory as a physicist in 1938. He reported to the Navy as Lieutenant, U.S.N.R., in 1941.

Lt. Com. Morgan R. Norton is doing construction work in the South Pacific. He began work at Port Arthur as a draftsman in 1931, was transferred to Beacon as an engineer in 1938. He is civil engineering graduate of the University of Michigan.

Captain Francis Peterson has been stationed at the Army's tank automotive center at Detroit, now is hospitalized with infantile paralysis at the Percy Jones Hospital, Battle Creek, Mich. He was employed at Beacon as a mechanical engineer in 1936, after graduation from Massachusetts Institute of Technology. The Ordnance Dept. called him to active duty from the Reserves in 1942 as a First Lieutenant.

T/3 Harold G. Sprague was a Pharmacist's Mate in the Navy, now is attached to a petroleum products laboratory somewhere in the Pacific. He joined Beacon as a chemist in 1939, leaving for service in the armed forces in 1941. He is a graduate of Bucknell University.

Major William T. Tierney, Jr., is with an Engineer Combat Group at Ft. Jackson, S. C., and was formerly an instructor of maintenance and upkeep of heavy automotive equipment at Ft. Belvoir, Va. He joined Beacon as a mechanical engineer after graduating from New York University in 1940 and was granted military leave a year later as a 2nd Lt. in the Reserves.

Major Joseph C. Wagner is an instructor of Ordnance in England. At Beacon he was a mechanical engineer from 1937 until 1941. A graduate of University of Michigan, he held a commission as a 2nd Lt., Ordnance Reserve.

Captain Orval A. Wray is an inspector in the Chemical Warfare Service. A graduate of Purdue University in chemical engineering, he was employed by Anderson-Pritchard Oil Co. at Chicago before joining Beacon as a chemical engineer in 1941. A year later he was called to active duty as a 2nd Lieut., Chemical Warfare Reserves.

The Texas Co., Port Arthur

Lt. Sam Butler, Jr., is stationed with the Navy in Cambridge, Mass., in a capacity wherein he utilizes his knowledge of petroleum products. He joined the West Dallas Works in 1939, later transferred to the research laboratory at Port Arthur, where he remained until 1940. He is a chemical engineering graduate of the University of Texas.

Lt. C. M. Cutbirth is stationed with the Navy in an oil position at New York City. He was an assistant to the chief chemist at Port Arthur when he entered the Navy in 1943, having joined the company in 1929. He also is a chemical engineering graduate from University of Texas.

Major N. W. Faust is stationed with the Technical Division Service Branch, Fuels and Lubricants, Ordnance Dept., Washington. Major Faust joined the company at Port Arthur in 1930, was assistant director of grease research when he left for the Army in 1942. He is a chemical engineer graduate from Rice Institute, 1930.

Lt. R. H. Park is overseas with an Engineer Petroleum Distribution Company. Holding Bachelor's and Master's degrees in chemical engineering from Massachusetts Institute of Technology, he joined the Port Arthur works in that capacity immediately upon graduation in 1939, remaining until released for Army duty in 1942.

The Texas Co., Production Dept.

Lt. (j.g.) T. M. Hogan is Naval "trouble shooter" for petroleum products in the territory covering North and South Carolina and Georgia. Following graduation from University of Oklahoma in 1933 as a petroleum engineer, he joined The Texas Co. at its Lawrenceville, Ill., refinery, working there in various capacities until transferred to the Production Dept. in 1935. In the Production Dept. he progressed from roustabout through neer to appointment as Panhandle (Tex.) various positions as a petroleum engi-

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District Engineer, which position he held until he joined the Navy in 1942.

Lt. L. E. Nugent commands his squadron and interprets aerial photographs for the Navy from an island in the central Pacific, reflecting his geological work with The Texas Co.'s Production Dept. He was a geologist at Midland, Texas.

Lt. Lawrence J. Vittrup commands an Engineer Petroleum Distribution Company in India; present activities include pipeline supply, transportation, construction and operation. He was an exploitation geologist for the Production Dept. before joining the Army.

Pure Oil Co.

Of some 13 technically trained refinery employees of Pure now in the armed forces, four are believed to have military duties which permit utilization of their training and experience in petroleum technology.

Colonel M. B. Chittick now is attached to the Chemical Warfare Service with last address listed as Washington; it is believed he now is overseas. With Pure he was manager of Specialty & Sales Dept., Chicago.

Captain William J. Lawless, Jr., now is attached to the Office of Quartermaster General, at Washington. He was assistant operating foreman at Pure's Heath (O.) refinery before going on military leave.

T/4 Don A. Milligan is overseas with an Army ordnance unit. He was a chemist at the Toledo refinery before entering the Army.

Major Fred P. Robinson, Jr., is attached to the Fuels and Lubricants Division, Office of Quartermaster General, Washington. With Pure he was assistant resident chemist at the Cabin Creek (W. Va.) refinery.

Standard Oil Co. of Louisiana

Captain A. C. Worsley is attached to the 949th Quartermasters Petroleum Products Laboratory, Camp Lee, Va. He joined the company as a process engineer, Process Control Laboratory, at Baton Rouge, and went on military leave in 1942.

Continental Oil Co.

Lt. C. C. Chaffee now is with the Office of Quartermaster General, Ordnance Division, Washington. He joined Continental as a chemist in 1926 upon graduating in chemistry from Kansas University, and was a technologist at the pressure stills, Ponca City, Okla., refinery when he went on military leave.

Captain W. M. Cocke is a field representative for PAW, stationed currently in the Process Section, Washington. With Continental since 1925, he served successively as chemist, clerk, lubricating oil division foreman, Baltimore refinery process superintendent, Lake Charles refinery assistant superintendent and Denver refinery superintendent.

Major H. E. Luntz is attached to the Office of Quartermaster General, Fuels and Lubricants Division, Washington. With Continental since 1936, he was first a gas plant technologist, later being transferred to the Lake Charles refinery as resident chemist (from the time the plant was built). He holds a bachelor's degree in chemical engineering from Georgia School of Technology and a master's from the University of Michigan.

Sinclair Refining Co.

Captain W. B. Bassett is now attached to Office of Chief of Ordnance, Technical Division, Fuels and Lubricants Branch, Washington. He also is a member of the Coordinating Research Council. Graduating in chemical engineering from Purdue University in 1932, Capt. Bassett joined Sinclair's Research & Development Dept. at E. Chicago,

Capt. Bassett

Lieut. Hoffmeister

being transferred in 1937 to the Sales Dept. as automotive engineer handling lubricating oil and other sales problems out of Atlanta, Ga. Later, he moved to Kansas City in the same capacity, to remain until entering the Army.

Lt. (j.g.) Kenneth L. Bergstrom is Navy Inspector at Republic Oil Refining Co., Texas City, charged with specification acceptance of petroleum products for the Navy. He joined Sinclair's Research & Development Dept. as a chemist in 1936 after graduating in chemistry and chemical engineering from Tri-State College, Angola, Ind. Later he was transferred to research and testing of lubricants and lubricating oil additives, where he remained until receiving his commission in 1943.

Lt. Louis N. Hoffmeister now is somewhere on the Gulf Coast, handling petroleum supply problems as he did at Pearl Harbor Naval Base. He also was a Research & Development Dept. man, 1937-1942, working on research problems in connection with fuels and lubricants. He is a chemical engineer from University of Missouri. 1933.

Ensign Raymond E. Lucht is stationed in the vicinity of New York City as an inspector of petroleum products for the Navy. He was employed by Sinclair to perform petroleum chemical research on lubricating oil problems in 1942, immediately upon graduating in chemical engineering from Purdue University. He was commissioned Ensign in 1943.

Standard Oil Co. (Ind.)

Major Robert J. Brauer is in Italy, travelling via jeep over liberated territory, inspecting captured weapons, etc., and giving the Army technical appraisal of their possible good and bad points. He is on leave from Wood River (Ill.) refinery.

Captain Ford H. Blunck is in England on a petroleum assignment for the Army. On leave from Whiting (Ind.) refinery.

Lt. (j.g.) P. H. Carstensen is attached to the Office of Inspector of Naval Material at New York where he is concerned with quantity and quality of bulk petroleum products shipments for our armed forces and the Allies. He is on military leave from Whiting refinery.

Lt. Colonel John B. Cobb is with the Chemical Warfare Service in France; he helped make invasion plans and was under fire at St. Lo. While with Standard he was located at Sugar Creek (Mo.) refinery.

Captain J. B. Duckworth is assigned to the Fuel & Lubricant Section, Power Plant Division, U.S.A.A.F. Materiel Command at Wright Field, Davton. He was formerly located at Standard's Whiting refinery.

Captain C. D. Fentress is attached to Process Section, Refining Division, Petroleum Administration for War, Washington. He was formerly located at Whiting.

Lt. Commander C. S. Goddin is attached to the Specifications Branch, Navy Bureau of Ships, Washington. He also is from Whiting refinery.

Major R. H. Hahn is in the Fuels & Lubricants Division. Office of Quartermaster General, Washington, on leave from Sugar Creek refinery.

Lt. William P. Hilliker represents the Navy at the Republic Refining Co., Texas City, Texas. He was in Standard's general office at Chicago.

Commander G. G. Lamb is connected with the Bureau of Aeronautics, and represents the Navy on the Coordinating Research Council. He was connected with Standard's general office, Chicago, before taking military leave.

Major R. W. Pachaly is on loan from the Army to PAW's Refining Division, Technological Section, Washington. He is on leave from Whiting.

Lt. Commander D. B. Peyton was formerly in charge of maintenance and overhaul at Pearl Harbor and now is located at the Naval Air Station, Miami, Fla. He also is on leave from Whiting refinery.

Lt. Colonel W. B. Plummer is a member of the Aviation Fuel Branch, Army Air Forces, Washington, and one of the Coordinating Research Council. In peacetime he was connected with Standard's general office, Chicago.

Evaporation Losses of Aviation Gasoline in Standing Storage

PART 2—Tests with Blending Stocks

By Peter Grandone

This is the second and concluding part of a formerly restricted report by the Bureau of Mines dealing with evaporation losses from aviation gasoline in standing storage. This section deals with such losses on neohexane and iso-octane, and also considers the physical effects of evaporation losses on the characteristics of the product. A summary of the entire report is included.

The first part of the report, published in the April 4th NPN Technical Section, (p. R-252) discussed evaporation losses on finished aviation gasoline.

FOUR evaporation-loss tests were conducted on two types of blending stocks in standing storage from March 20 to November 25, 1941. The blending stocks were fairly pure hydrocarbons, namely, neohexane and isooctane, with vapor pressures of about 10.0 and 1.8 psi, respectively.

Tests D and E were on neohexane, which was stored in one cone-roof and one breather-roof type tank of 55,000-bbl. capacity; tests F and G were on isooctane, also stored in one cone-roof and one breather-roof type tank of 55,000-bbl. capacity.

A meteorological summary covering each month in the test period is given in Table 4.

Tests on Neohexane Blending Stocks

Test tanks D and E containing neohexane were each 55,000 bbls. in capacity and all-steel construction. Tank D was equipped with a cone roof (see Fig. 1)* and three 6-in. combination flame arresters and vent valves (see Fig. 2) operating between 0.5 oz. per sq. in. pressure and 0.2 oz. per sq. in. vacuum.

In addition to being painted all white for heat reflection, the tank was equipped with a water-spraying system on its roof, which was in operation from May 21, 1941, to the end of the test period. None of the other three tanks used for storing blending stocks was cooled by water spraying.

Test tank E was equipped with a modified breather roof (see Fig. 4) and with only one 8-in. combination flame arrester and vent valve operating between 0.5 oz. per sq. in. pressure and 0.2 oz. per sq. in. vacuum. As the weight of the roof exceeded 0.5 oz. per sq. in., it did not flex to accommodate vapor expansion except when the capacity of the automatic vent valve was exceeded.

The roof of the tank was painted white at the start of the test, but the side walls were not painted white until Sept. 1, 1941.

The evaporation-loss results obtained from Test D were observed on 51,512 bbls. (initial measurement corrected to 60° F.) of neohexane held in standing storage from April 28 to July 18, 1941. The losses sustained during the entire test period, as shown in Fig. 6, amounted to 315 bbls. of fuel or 0.61% of the initial volume. The curve in Fig. 6 also shows that the initial rate of evaporation (200 bbls per month) dropped slightly after May 21 as a result of the cooling effect of the water spray, which was turned on the tank deck at that time. Otherwise the rate of evaporation might have been even greater because of warmer weather.

The evaporation-loss results from Test E are shown in Fig. 7 and were observed on 50,770 bbls. (initial volume at 60° F.) of neohexane in storage from July 18 to Nov. 25, 1941. The total loss observed from Test E was 240 bbls. of fuel or 0.47% of the initial volume; the average rate of evaporation was about 57 bbls. (0.11%) per month. Thus the rate of evaporation from neohexane stored in the breather-roof-type tank was much less than the rate of evaporation of the same material stored in the cone-roof-type tank. Moreover, Test E ex-

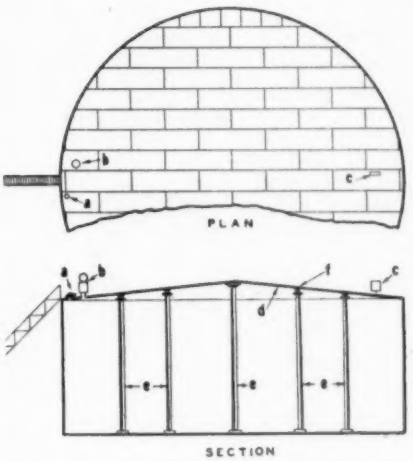

Fig. 1—Cone-roofed storage tank of 55,000 bbls. capacity, used in Tests D and F. The symbols indicate the following: a—gage hatch, b—pressure- and vacuum-relief valve, c—recording thermometer, d—rafters, e—columns, f—cone roof

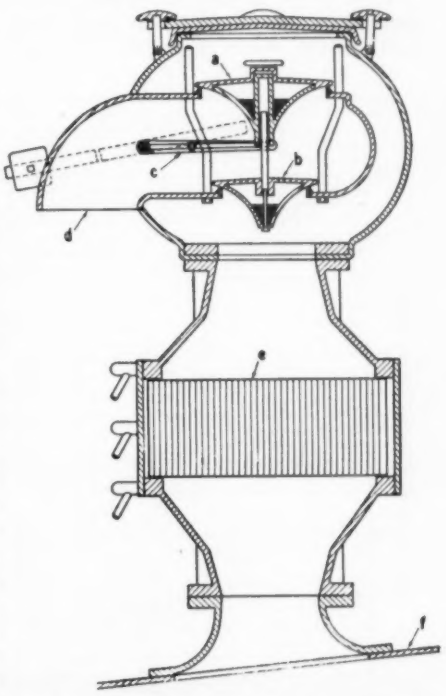

Fig. 2 — Pressure- and vacuum-relief valve and flame arrester, showing, a—vacuum-relief valve, b—pressure-relief valve, c—flame snuffer, d—vent, e—flame arrester, f—tank roof

*Figs. 1—5 appeared with Part 1 of this article in the April 4th Technical Section. Three of these, however, Figs. 1, 2 and 4 (which are referred to in Part 2), are again reproduced for the convenience of the reader.

The accompanying article is the concluding section of Report of Investigations 3701, "Evaporation Losses of Aviation Gasoline in Standing Storage," of the U. S. Bureau of Mines. Peter Grandone is Associate Petroleum Engineer, Bureau of Mines, Petroleum Experiment Station, Bartlesville, Okla. The first section of the report appeared in the April 4th NPN Technical Section.

TABLE 4—Meteorological Summary for March-November 1941*

Month	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.
Mean maximum temperature, °F.	53.8	66.3	74.9	81.8	87.4	88.0	81.1	67.6	61.8
Mean minimum temperature, °F.	32.5	44.2	53.3	58.9	63.2	63.0	57.3	48.7	33.5
Maximum temperature, °F.	83	79	90	94	95	97	95	86	76
Minimum temperature, °F.	20	30	46	51	59	57	40	31	14
Precipitation, total inches	2.55	1.26	7.47	5.07	13.35	3.18	4.30	7.64	0.33

*Data supplied by U. S. Weather Bureau, English Field, Amarillo, Tex.

TABLE 5—Laboratory Analyses of Neohexane Blending-Stock Samples Obtained at Beginning and End of Tests D and E

Test	Tank D (Cone roof)		Tank E (Modified breather roof)	
Date of sample	April 23, 1941	June 18, 1941	July 18, 1941	Nov. 25, 1941
Specific gravity at 60° F.	0.6562	0.6563	0.6559	0.6562
A. P. I. gravity at 60° F.	84.1	84.4	84.2	84.1
Reid vapor pressure, psi	10.1	10.1	9.7	9.9
Octane no. (A.F.D.-1-C), clear	90.3	90.8	91.0	90.0
Sulfur content, %	.006	.008	.007	.005
Color, Saybolt	30+	30+	30+	30+
Corrosiveness (copper-dish)	Neg.	Neg.	Neg.	Neg.
A.S.T.M. Distillation, D-86				
F. D., °F.	117	116	116	116
10%, °F.	120	120	120	120
20%, °F.	120	120	121	120
30%, °F	121	121	121	121
40%, °F.	122	122	122	122
50%, °F.	122	122	123	122
60%, °F.	123	123	123	122
70%, °F	123	123	124	123
80%, °F.	124	124	124	124
90%, °F.	126	125	126	126
95%, °F.	128	127	129	130
E. P. °F. (apparent)	134	130	134	137
Average boiling point	123	122	123	123

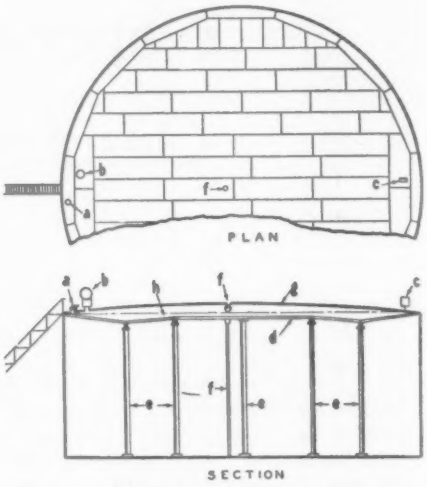

Fig. 4—55,000-bbl. storage tank with breather roof, used in Tests E and G. Symbols indicate: a—gage hatch, b—pressure- and vacuum-relief valve, c—recording thermometer, d — rafters, e—columns, f—water drain, g—breather roof in inflated position, h — breather roof in normal position

tended through more of the warmer months.

It must be mentioned, however, that precipitation in the area was above normal during these tests and that the breather-roof tanks tended to hold considerable rain water in puddles over the roof surfaces, owing to the uneven flexing of the type of breather roof used, which undoubtedly provided a certain amount of self cooling during much of the test period.

Results of laboratory tests on samples of neohexane obtained from tanks D and E at the beginning and end of the storage tests are shown in Table 5 and include the same determinations reported under Test A. Table 5 shows that the neohexane being tested had a specific gravity of 0.656 (84.1° A.P.I.), a Reid vapor pressure of about 10.0 psi., and a distillation range from 116° to about 134° F.

No appreciable changes of chemical

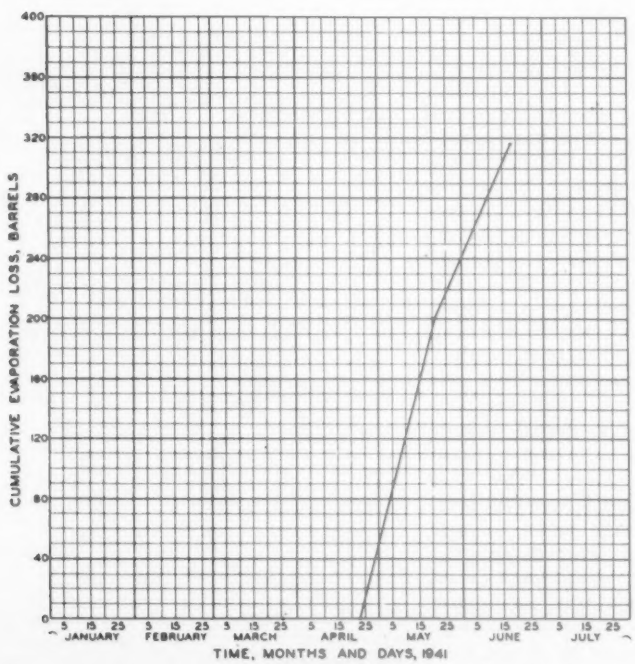

Fig. 6—Test D evaporation loss of neohexane blending stock from 55,000-bbl. storage tank with cone roof

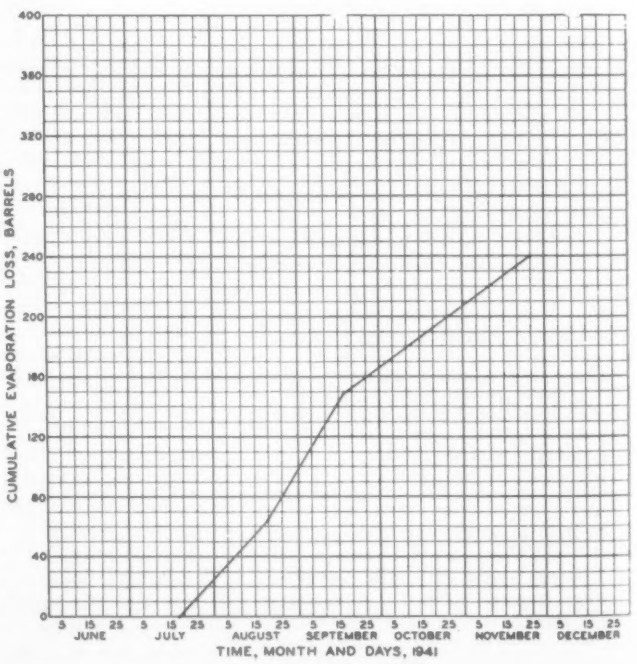

Fig. 7—Test E evaporation loss of neohexane blending stock from 55,000-bbl. storage tank with breather roof

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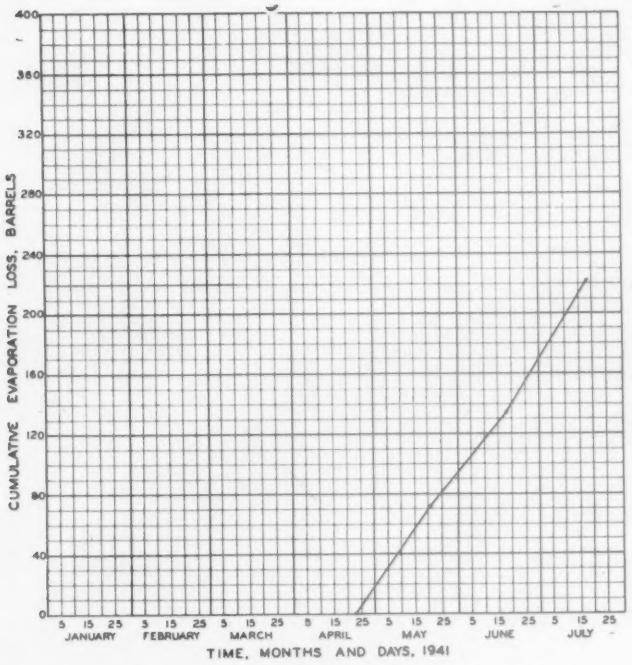

Fig. 8—Test F evaporation loss of isooctane blending stock from 55,000-bbl. storage tank with cone roof

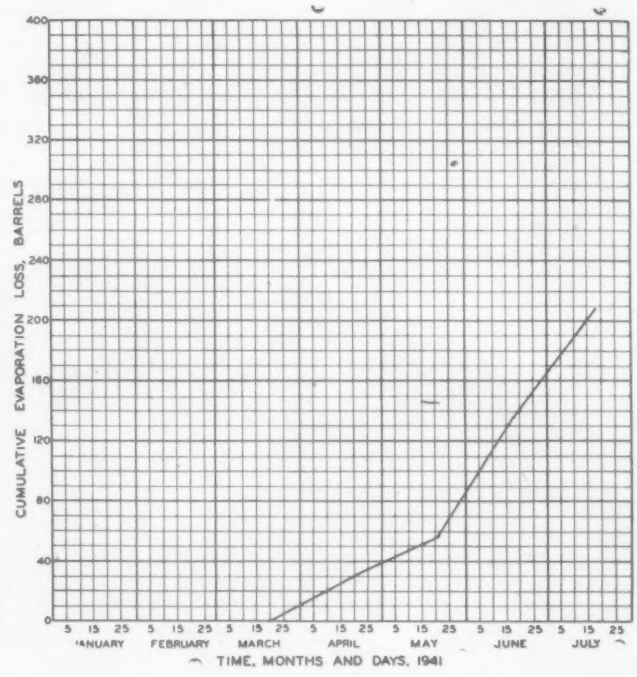

Fig. 9—Test G evaporation loss of isooctane blending stock from 55,000-bbl. storage tank with breather roof

and physical characteristics of the material stored in either tanks occurred during the storage periods. The few minor changes indicated in Table 5 are considered within the limits of laboratory accuracy.

Tests on Isooctane Blending Stock

Test tanks F and G, which contained isooctane, also were 55,000 bbls. in capacity each and of all-steel construction. Tank F was equipped with a cone roof (see Fig. 1) and with three 6-in. combination flame arresters and vent valves (see Fig. 2), which operated between 0.5 oz. per sq. in. pressure and 0.2 oz. per sq. in. vacuum. The entire surface of the tank was painted white for maximum heat reflection.

Test tank G was equipped with a modified breather roof (see Fig. 4) and one 8-in. combination flame arrester and vent valve, which operated between the same pressure limits cited under test tank F. All of the tank's surface had a coat of red-lead paint until June 18, 1941, when a coat of white paint was applied to the deck only.

TABLE 6—Laboratory Analyses of Isooctane Blending-Stock Samples Obtained at Beginning and End of Tests F and G

Test	Tank F		Test G	
	Cone roof		Modified breather roof	
Date of sample	April 23, 1941	July 18, 1941	March 20, 1941	July 18, 1941
Specific gravity at 60° F.	0.7207	0.7209	0.7223	0.7220
A. P. I. gravity at 60° F.	64.8	64.8	64.4	64.5
Reid vapor pressure, psi	1.7	1.8	1.8	1.7
Octane no. (A.F.D.-1-C), clear	88.7	89.2	89.1	89.1
Sulfur content, %	.005	.006	.007	.004
Color, Saybolt	30+	30+	30+	30+
Corrosiveness (copper-dish)	Neg.	Neg.	Neg.	Neg.
A.S.T.M. Distillation, D-86				
F. D., °F.	207	214	210	214
10%, °F.	223	223	225	224
20%, °F.	226	225	228	227
30%, °F.	229	229	230	230
40%, °F.	232	231	233	233
50%, °F.	235	234	236	236
60%, °F.	239	237	239	239
70%, °F.	245	243	245	245
80%, °F.	255	253	255	255
90%, °F.	297	291	302	308
95%, °F.	352	347	349	349
E. P. °F	363	363	364	364
Average boiling point	250	249	251	252
Recovery, %	98.4	98.4	98.5	98.6
Loss, %	0.5	0.4	0.6	0.2
Residue, %	1.1	1.2	0.9	1.2

The evaporation-loss results on Test F were observed on 52,974 bbls. (initial volume at 60° F.) of isooctane held in storage from April 23 to July 18, 1941. As is indicated by the curve in Fig. 8, the total loss sustained during the storage period was 222 bbls of fuel or 0.42% of the initial volume. This represents an average loss of about 80 bbls (0.15%) of fuel per month.

The evaporation losses sustained from Test G are given in Fig. 9 and were observed on 51,320 bbls. (initial volume at 60° F.) of isooctane in storage from March 20 to July 18, 1941. The curve in Fig. 9 shows that the total loss during the storage period was 208 bbls. of fuel or 0.40% of the initial volume. The rate of evaporation was about 28 bbls. (0.05%) of fuel per month up to May 21 and then increased to about 80 bbls. (0.16%) over the remainder of the storage period.

The sharp increase in evaporation, indicated by the steeper slope of the curve after May 21, may be expected from the rise in atmospheric temperature (see Table 4); the slight decrease indicated after June 18 probably is due to the cooling effect resulting from the application of a white coat of paint on the deck of the tank. Before June 18 the entire surface of the tank was painted red, a color that absorbs much heat.

The two evaporation-loss tests on the storage of isooctane extend over much of the same period, but show no appreciable differences in the magnitude of losses sustained by this material when stored in a cone-roof and a breather-roof tank. This may be explained in

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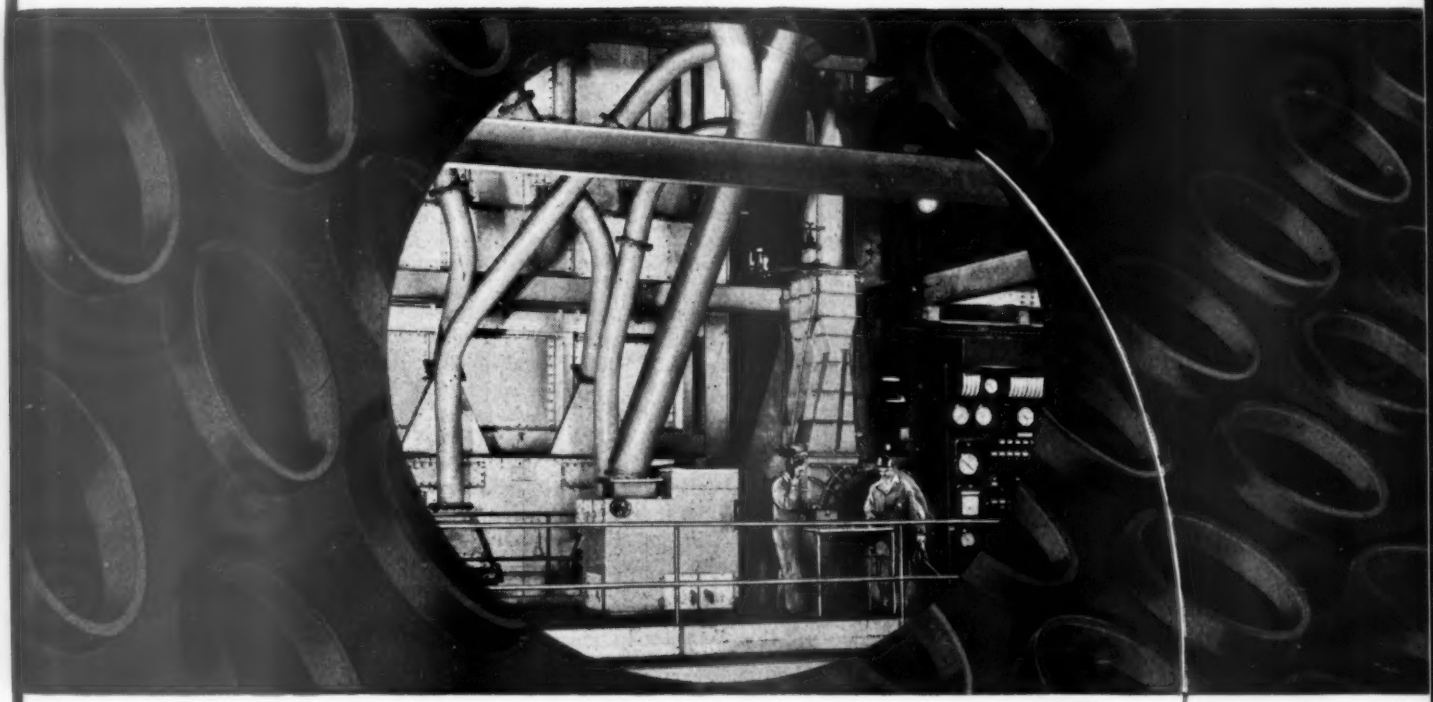

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part by the relatively low vapor pressure (about 1.8 psi) of the isooctane, thus causing less tank breathing from evaporation alone.

Laboratory results from samples of isooctane taken at the beginning and end of Tests F and G are reported in Table 6. The results show that the isooctane in test tank F had a specific gravity of 0.721 (64.8° A.P.I.), Reid vapor pressure of 1.8 psi, and a distillation range from 207° to 363° F. The isooctane in test tank G had a specific gravity of 0.722 (64.4° A.P.I.), a Reid vapor pressure of 1.8 psi, and distillation range from 210° to 364° F.

During storage the only apparent change that occurred in the characteristics of the isooctane was the initial distillation point, which increased 7° F. in test F and 4° F. in test G. Other minor changes are within the limits of laboratory accuracy.

Summary and Conclusions

Evaporation-loss tests were made by the direct gaging method in the Texas Panhandle area on three storage tanks containing approximately 50,000 bbls. each of blended aviation gasoline and on four storage tanks containing approximately 50,000 bbls. each of special blending components of aviation gasoline. The storage tanks were all-steel construction, with capacities of 55,000 bbls. each, and were equipped either with cone-type or with breather-type roofs. Special features common to all tanks were the use of vapor-vent valves operating between 0.5 oz. per sq. in. pressure and 0.2 or 0.5 oz. per sq. in. vacuum, and the use of white painted surfaces for maximum heat reflection. However, one tank (Test G) was painted red during the first part of the test and had the deck surface only painted white during the last month of the test period. The decks of two of the cone-roof tanks were sprayed with water for additional cooling.

The three evaporation-loss tests (A, B, and C) on the storage of blended fuel showed the following results: In Test A, (conducted on a cone-roof tank) the total loss sustained in 175 days from Jan. 21 to July 15, 1942, was 470 bbls. or 0.93% of fuel; in Test B, on a breather-roof tank, a total loss of 63 bbls or 0.12% of fuel in 105 days from April 15 to July 29, 1942; and in Test C, also on a breather-roof tank, a total loss of 184 bbls. or 0.36% of fuel in 112 days from Feb. 18 to June 10, 1942.

The above tests show that the losses sustained over the test periods are very nominal, and although all tests do not extend completely over the same period, the rate of evaporation of the blended fuel from the cone-roof tank is greater than from either of the breather-roof tanks, especially during the warmer season. The rate of evaporation measured in Test B is particularly low because the deck of the tank was water-sprayed for additional cooling from June 24 to July 29, 1942.

The evaporation-loss tests on the special blending stocks were on two storage tanks (Tests D and E) containing neohexane and on two storage tanks (Tests F and G) containing isooctane.

Results from Tests D and E show that the loss sustained by storage of neohexane having a vapor pressure of about 10 psi in cone-roof tank D for 57 days (April 22 to June 18, 1941) was 0.61% or 315 bbls. The loss in storing the same material in a breather-roof tank (Test E) for 130 days (July 18 to Nov. 25, 1941) was only 0.47% or 240 bbls. Considering that the cone-roof tank was all white and water-sprayed, whereas the breather-roof tank was all white during only part of the test period and was not water-sprayed, and that the test was made during a period of warmer weather, it appears that the breather-roof tank was more effective in reducing evaporation losses than the test data indicate.

Results from Test F on a cone-roof tank show that the evaporation loss of isooctane, which has a vapor pressure of about 1.8 psi., amounted to 0.42% or 222 bbls. for a storage of 86 days (April 23 to July 18, 1941). The loss of the same material stored in a breather-roof tank, Test G, for 133 days (March 20 to July 18, 1941) was 0.40% or 208 bbls. Although the results of tests with stored isooctane slightly favor the breather-roof tank, the difference in loss between the two types of storage is not as pronounced as with the storage of the more volatile neohexane in the two types of storage tanks.

The use of direct-action mechanical-volume-control valves on the tanks equipped with modified breather roofs probably would have reduced the evaporation losses from test tanks B, C, F, and G further because this type of valve remains closed until the breather roof reaches its expanded position, thus preventing the escape of the tank vapors to the atmosphere caused by minor variations of temperature and pressure.

The effectiveness of breather-roof tanks over cone-roof tanks in reducing loss by evaporation is more evident in the storage of fuels of relatively high vapor pressure than in the storage of less-volatile fuels.

Laboratory determinations on samples of the stored fuels, obtained at the beginning and end of each evaporation test, showed only slight changes of gravity and of temperatures on the first three distillation points of the A.S.T.M. distillation test on the blended fuel, but not on the blending stocks.

Other laboratory determinations, including octane number, sulfur content, vapor pressure, color, and corrosiveness, showed no appreciable changes in any of the materials stored, indicating that neither the chemical nor physical characteristics of the fuels were affected appreciably during the storage periods.

Acknowledgments

This investigation was conducted under the general supervision of R. A. Cattel, chief engineer, Petroleum and Natural Gas Division, Bureau of Mines, Washington, D. C., and N. A. C. Smith, supervising engineer of the Bureau of Mines Petroleum Experiment Station, Bartlesville, Okla.; and under the direct supervision of Ludwig Schmidt, senior petroleum engineer of the Bureau of Mines. The laboratory tests were made at the Bureau of Mines Petroleum Experiment Station, Bartlesville, Okla.

Acknowledgment is made to the officials of the Phillips Petroleum Co., Bartlesville, Okla., for their cooperation and facilities which made this investigation possible. Special acknowledgment is made to the Materiel Division, United States Army Air Forces, Wright Field, Dayton, Ohio, for granting permission to conduct this study on its reserve storage of aviation gasoline.

Drawings and graphs were made by Earnest Daniel of the Bureau of Mines.

The writer thanks D. B. Taliaferro, Jr., of the Bureau of Mines, for constructive review of the manuscript.

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ENGINE OIL FOAMING

(Progress Report of the Group on Foaming, Engine Oil Division, CRC Coordinating Lubricants Research Committee)

By H. A. Ambrose and C. E. Trautman

The development of successful anti-foam additives for lubricating oils has proceeded rapidly since the problem was first brought forward in 1943 by the Army Ordnance Department, as a result of reports of failures in aircraft engines from this cause.

A group sponsored by the CRC Coordinating Lubricants Research Committee worked up a test procedure for evaluating foaming characteristics which has been included in Army Specification 2-104B. Anti-foam agents have been developed which eliminate mineral oil foaming under most conditions during the life of the oil and have no detrimental effect on the oil. Anti-foam additives have also found successful application in automotive gear oils, steam turbine oils and various industrial lubricating oils.

IT IS already well known that the foaming of engine oils often can be prevented more easily by use of small proportions of foam inhibitors than by mechanical alterations in the engines. Several mechanical devices, including foam separators and centrifuges, have been proposed for eliminating foam, and sometimes changes in design of scavenging pumps, oil tanks, and general piping of the lubricating oil systems may be helpful.

Engine failures may be caused by the foaming of engine oils in several ways; for example, in an aircraft engine, foam which has been formed by picking up air at the scavenge pump may cause enough entrainment of air to allow a mixture of air and oil to be fed to the pressure pump. In addition, if the engine is flown rapidly from low altitude to high altitude, the lowering of atmospheric pressure releases air dissolved in the oil and increases the volume of entrained air bubbles. In either case foam, or oil containing high percentages of entrained air, may cause bearing failure, and may also cause displacement and loss of oil from the lubricating system.

Another difficulty is caused by foaming, especially in ground vehicles, where an erroneous oil level is indicated by the common dip-stick method of measuring. If the dip-stick is wet by a high foam level, a high oil level is indicated, although the crankcase may contain almost no bulk oil. A number of engine failures have occurred as a result of such false indication of oil level, and consequent failure to detect a dangerously low oil supply.

Before 1942 very little work had been done on prevention of foaming of lubricating oils, although serious foaming problems had occasionally occurred in equipment such as racing car engines, automotive gears, industrial gears, and steam turbines.

In 1942 foaming problems reached serious proportions in certain aircraft engines, naval Diesel engines, and military tank engines and gears. About this time several aircraft engine manufacturers and petroleum oil laboratories, as well as the National Advisory Committee for Aeronautics, became interested in foaming of aircraft engine oils.

By March, 1943, the foaming of engine oils in military vehicles was considered to be so serious that the formation of a working group sponsored by the CRC Coordinating Lubricants Research Committee was proposed to study the matter. The CLR Group on Foaming, formed as a result of the Ordnance Department's official request of April, 1943, developed a "Procedure for Determination of the Foaming Characteristics of Lubricating Oils." This procedure was made available by the Coordinating Research Council as "CRC Designation L-12-1143" in November, 1943. The procedure involves the use of simple laboratory apparatus designed to introduce finely-dispersed air at a controlled rate under the surface of the oil sample. The apparatus is illustrated in Fig. 1.

Data obtained by this test correlated well with: (1) field service data obtained at the General Motors Proving Grounds, (2) field service tests made at Camp Seeley and (3) at Fort Knox, and (4) laboratory engine tests made by the U. S. Naval Engineering Experiment Station at Annapolis. The results of field

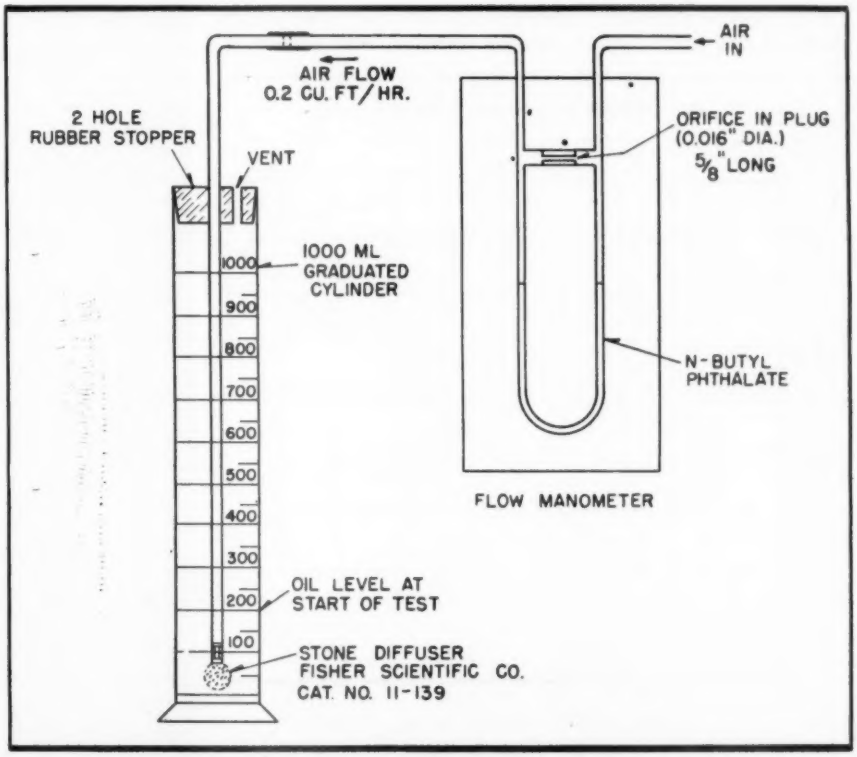

Fig. 1—Foam test apparatus (CRC Designation L-12-1143)

This article is the principal portion of a paper presented under the above title at the War Engineering Annual Meeting of the Society of Automotive Engineers, Detroit, Jan. 8-12, 1945. H. A. Ambrose, assistant head of the Chemistry Division, Gulf Research & Development Co., Pittsburgh, is the leader of the CLR Foaming Group. C. E. Trautman is a research chemist, Gulf Research & Development Co.

OIL	SEQ.	FOAM COLLAPSE ML. FOAM 10 MIN. AFTER FOAMING RANGE	AVERAGE	MAX VALUE FOAM COLLAPSE U.S. ARMY SPEC. 2-104B	RATING BY L-12-1143	FIELD SERVICE RATING
F-15	(1)	515-660	592	(1) 300	BAD FOAMER	BAD FOAMER
	(2)	585-780	706	(2) 25		
	(3)	490-685	576	(3) 300		
F-16	(1)	145-325	211	(1) 300	NON-FOAMER *	NON-FOAMER
	(2)	0-120	46	(2) 25		
	(3)	150-340	229	(3) 300		
F-17	(1)	260-470	369	(1) 300	MODERATE FOAMER	MODERATE FOAMER
	(2)	455-695	612	(2) 25		
	(3)	175-460	331	(3) 300		
F-18	(1)	0	0	(1) 300	NON-FOAMER	NON-FOAMER
	(2)	0	0	(2) 25		
	(3)	0	0	(3) 300		

* SLIGHT FOAMER BY SEQUENCE 2

Fig. 2—Laboratory foam test results and their correlation with field service tests

service tests are compared in Fig. 2 with laboratory test results. Additional data are illustrated by the curve in Fig. 3.

The CLR procedure was adopted by the Army Ordnance Department for evaluation of the foaming characteristics of lubricating oils, and specification limits for new (unused) oils were included in U. S. Army Specification 2-104B, Amendment 2, for S.A.E. 30 and S.A.E. 50 engine oils. A similar limitation is included in Bureau of Ships Specification 14-0-13 (INT).

The specification limits are satisfactory for assuring freedom from foaming of new (unused) oil, but do not insure absence of foaming for used oils excepting for those oils in which a satisfactory, persistent, anti-foam agent is used.

The really important objectives to be reached by the CLR Working Group on Foaming were (1) the study of foaming of engine oils, with emphasis on anti-foam agents as a solution to the pressing problems of foaming, and (2) the dissemination of this information throughout the industry. As a result of this work non-foaming engine oils are widely available for the Army and Navy and, as far as can be determined, complaints from foaming of Army and Navy specification engine oils have been eliminated.

Anti-Foam Agents Found

The possibility of finding successful anti-foam additives apparently did not receive much attention during the early studies of engine oil foaming. Some technical men in this country pessimistically concluded from a theoretical study that foaming of oils could not be prevented by additives. In Europe, a group studying the foaming of aircraft engine oils concluded that very little could be done in the way of using additives to prevent foaming. Their reasoning was somewhat as follows: Although castor oil was known to foam somewhat less than mineral oil, castor oil still foamed considerably in engine tests. The additives which were then known were not able to reduce foaming of mineral oils in laboratory tests to much less than that of castor oil. Therefore, it was concluded that mineral oil containing these additives would not offer much improvement.

However, the problem has been solved in this country by the discovery of anti-

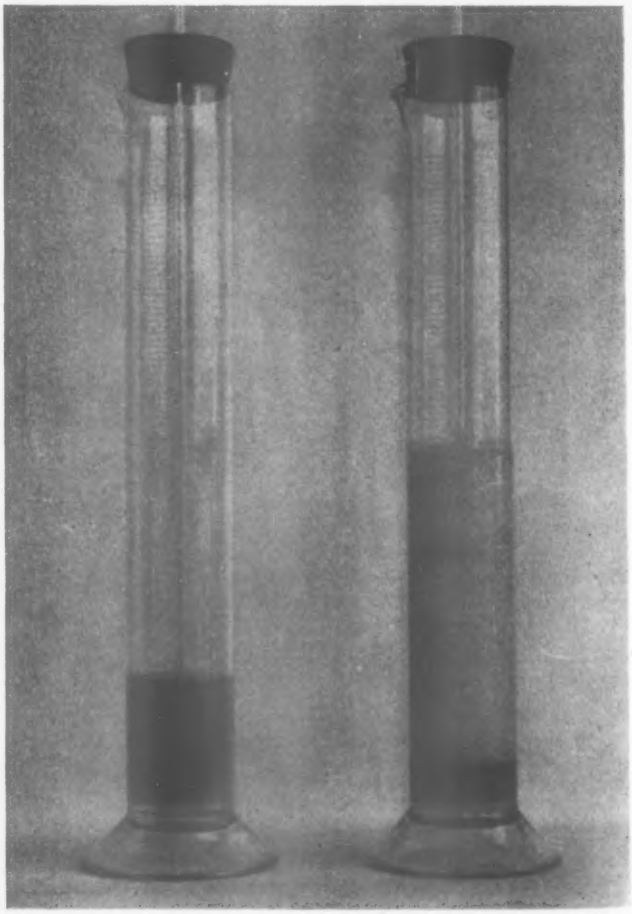

Fig. 4 (right)—The results of using an anti-foam agent are shown in this photograph of two oil samples, both subjected to the same laboratory test. The sample on the left contains an additive to prevent foaming

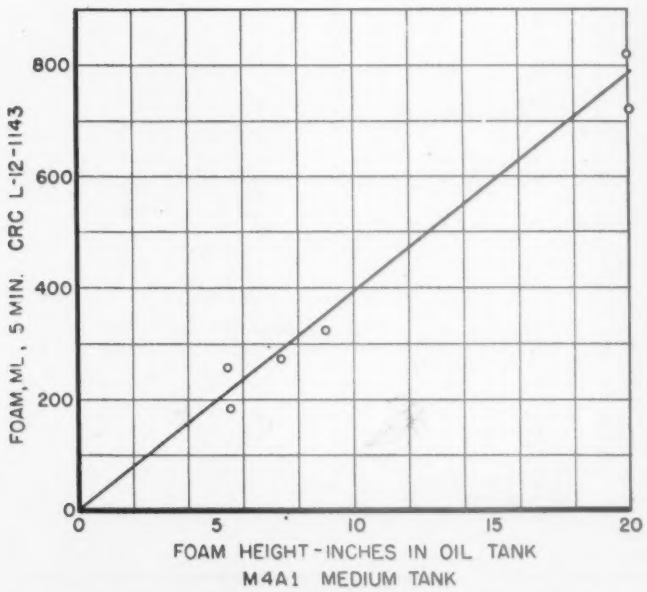

Fig. 3 (above)—Laboratory and field foam test correlation

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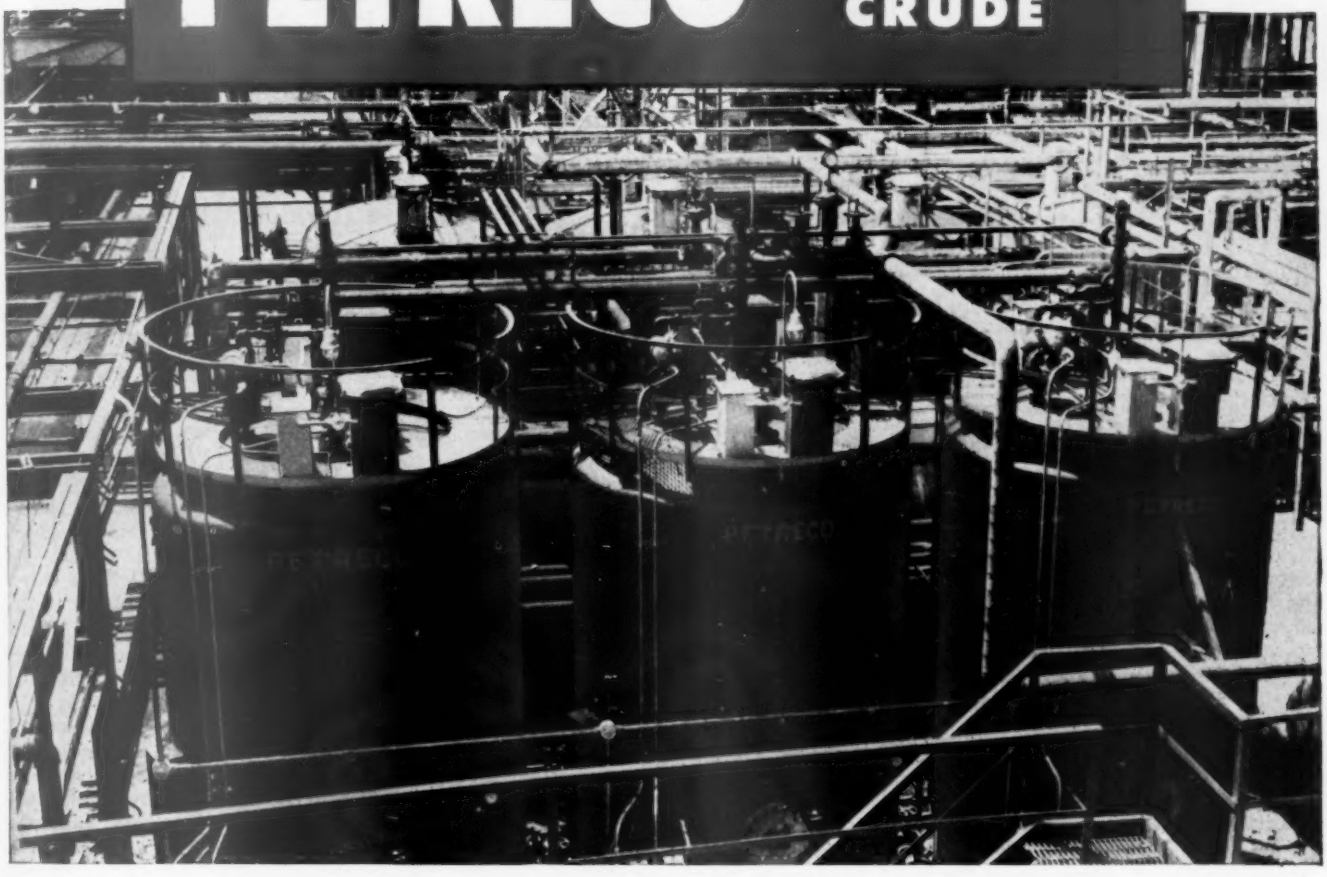

Ashland Oil & Refining Company's Petreco desalting plant, illustrated above, processes a mixture of Illinois, Texas and Kentucky crude prior to charging to their crude topping unit. The reduced crude, from this operation then is charged to their cracking unit.

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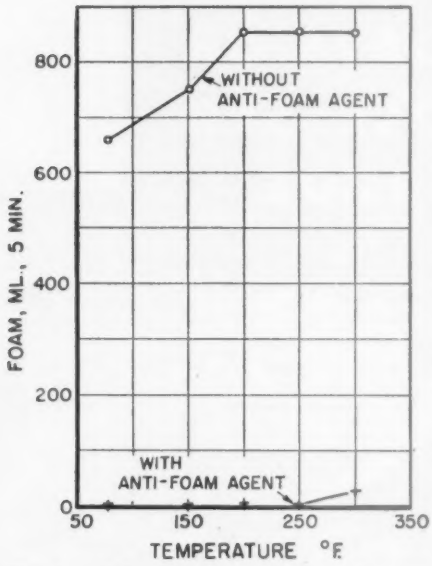

Fig. 5-a—Effect of temperature on foaming, using an S.A.E. 50 detergent oil, Army specification 2-104B

foam agents which eliminate mineral oil foaming under most conditions. Anti-foam additives are now widely used in oils covered by the Army and the Bureau of Ships Specifications mentioned previously. No case has been reported in which these anti-foam agents, when properly applied, have failed to prevent foaming of engine oil. In addition to these specification oils, anti-foam agents have found successful application in automotive gear oils, steam turbine lubricating oils, industrial gear oils, hydraulic oils, and special industrial lubricating oils.

An example of anti-foam action is illustrated by Fig. 4, which shows the behavior of two oils, one containing an anti-foam agent, in the laboratory foam test (CRC Procedure L-12-1143).

In developing anti-foam agents for engine oil, attention was directed toward additives that would (1) do the job efficiently, and (2) would have no adverse effect on functional properties of the oil. A large number of additives have been discovered which reduce foaming of engine oils, but many of these are not useful because the anti-foam effect does not persist during conditions of operation. They may be destroyed by the effects of heat or oxidation; they may be lost by vaporization or chemical change.

The effect of elevated temperatures on foaming of engine oils is shown by data in Fig. 5. The detergent oil meeting Specification 2-104B (except for the foaming requirement) shows an increase in foaming with increase of temperature. Data for the high V.I. oil without a detergent illustrate the usual foaming behavior of an oil at elevated temperature. Addition of the anti-foam agent practically eliminated foaming of either oil at all temperatures.

The persistence of an anti-foam agent under severe conditions of oxidation is shown by data in Fig. 6. The foaming tendency of the oil without additives increased with oxidation, while the oil containing an anti-foam remained completely non-foaming under the severe conditions of Underwood oxidation at 325°F. Another commercial anti-foam additive was destroyed and did not persist under these conditions.

Evidence of the persistence of an anti-foam agent under severe conditions of engine operation is included in Fig. 7. Foaming of the oil was eliminated under

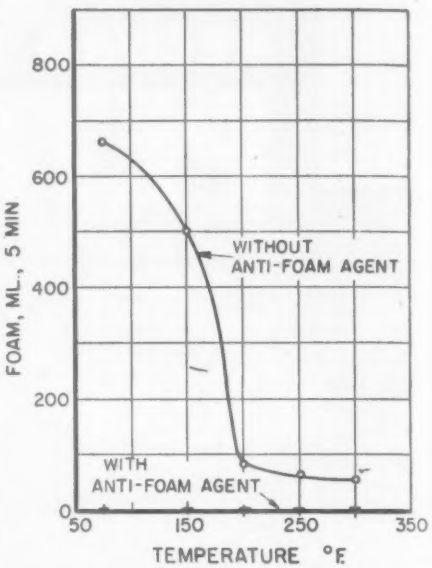

Fig. 5-b—Effect of temperature on foaming, using an S.A.E. 50 oil of 105 V. I.

all conditions of the Lauson engine test shown. In other tests, not illustrated here, the action of an anti-foam agent has persisted far beyond the usual life of the oil.

It is rare to find an oil additive that does as efficient a job for its intended purpose as the anti-foam agent, and at the same time does not affect some other functional properties. Industry in general is quite willing to concede that a new additive will perform the duty for which it is intended and developed, but industry also naturally desires assurance that the additive will not cause any adverse effects. The aircraft industry has been particularly reluctant to accept oil additives, although the automotive industry has been

	ML. FOAM (5 MIN.) AT 200° F. (CRC L-12-1143)				
HRS. OXIDIZED	0	3	6	9	12
OIL	240	215	255	375	505
OIL + ANTI-FOAM AGENT	0	0	0	0	0
OIL + UNSATISFACTORY COMMERCIAL ANTI-FOAM AGENT	0	180	200	160	180

Fig. 6—Effect of oxidation on the serviceability of an anti-foam agent (Underwood test, 325° F., Cu/Pb bearing, S.A.E. 50 paraffin base oil, 105 V. I.)

	NEUT. NO.	NAPTHA INSOL. SLUDGE MG/10 GMS.	VISCOSITY S.U.S. AT 100°F.	BEARING CORROSION GMS. LOSS
	OXIDIZED 6 HOURS			
OIL	0.83	2.7	1208	0.030
OIL + 10 TIMES RECOMMENDED CONC. ANTI-FOAM AGENT	0.94	2.6	1190	0.015
	OXIDIZED 12 HOURS			
OIL	13.8	4.0	2945	0.198
OIL + 10 TIMES RECOMMENDED CONC. ANTI-FOAM AGENT	12.5	3.2	3039	0.103

Fig. 8—Effect of anti-foam agent on the oxidation of an S.A.E. 50 oil, 105 V. I. (Underwood test, 325° F., Cu/Pb bearing)

	CRANKCASE TEMP.	ENGINE HRS.	ML. FOAM CRC PROCEDURE 77°F	200°F.
S.A.E. 50, 105 V.I. OIL	190°F.	0	625	240
		20	540	215
S.A.E. 50, 105 V.I. OIL + ANTI-FOAM AGENT	190°F	0	0	0
		20	0	0
S.A.E. 30, SPEC. 2-104B OIL	225°F	0	650	780
		216	630	100
S.A.E. 30, SPEC. 2-104B OIL + ANTI-FOAM AGENT	225°F.	0	0	5
		216	0	0

Fig. 7—Effect of engine operation on foaming. Tests were run in a Lauson engine at 1850 rpm, an output of 3 H.P., and jacket temperature of 340° F.

		OIL PROPERTIES		
CRANKCASE TEMP. °F.	ENGINE HOURS	NEUT. NO.	NAPTHA INSOL. SLUDGE MG/10 G.	VISCOSITY S.U.S. 100°F.
S.A.E. 50, 105 V.I. 190°	0	0.03	0.4	1100
	10	1.24	10.5	1210
	20	2.95	11.0	1493
S.A.E. 50, 105 V.I. 190°	0	0.03	1.7	1143
	10	1.20	7.3	1165
	20	3.31	9.9	1473

Fig. 9—Effect of anti-foam agent on oil properties during engine tests, conducted in a Lauson engine at 1850 rpm, 3 H.P. output, and 340° F. jacket temperature

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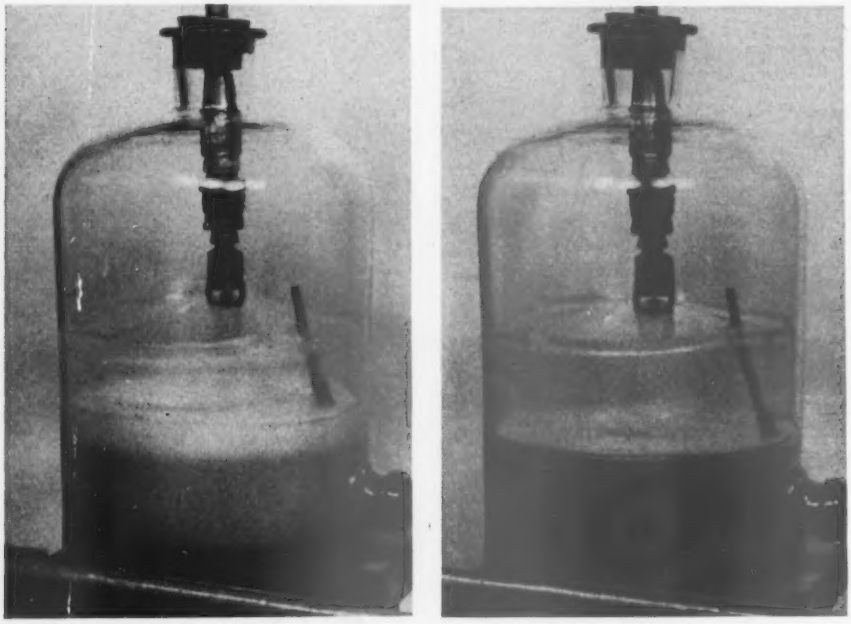

Fig. 10—Anti-foam agents prevent foaming by promoting the junction of gas bubbles of moderate size in the liquid phase, so that they rise more rapidly to the free surface, where the larger bubbles burst, as shown in the photographs above. Sample on right contains anti-foam additive

receptive. Usually the first question asked about a new additive is: "Is it safe to use in the engine?" Specifically: Does the additive have any adverse effect upon the following items:

Wear,
Load-carrying capacity,
Engine deposits,
Bearing corrosion.

The results of extensive tests in laboratory wear machines, laboratory test engines, full-scale aircraft engine cylinders, as well as extensive service in military and naval equipment, indicate that the foam inhibitors now in use have no detrimental effect on the oil. Reports of these tests usually have been issued under a restricted or confidential designation, so unfortunately only a limited amount of such information can be supplied here.

The Underwood oxidation data in Fig. 8, which are typical, indicate that an anti-foam agent now used in specification 2-104B oils has no adverse effect either on the course of oxidation or on bearing corrosion. Similar results, obtained in engine tests, are illustrated in Fig. 9.

Many other laboratory engine tests, including those made at the Naval Engineering Experiment Station and those made by aircraft engine manufacturers, indicate that anti-foam agents now in use have no detrimental influence on engine operation.

Air entrainment is sometimes confused with foaming. Anti-foam agents prevent foaming by destroying bubbles when they reach a free surface, almost as rapidly as they are formed. Obviously, anti-foam agents cannot prevent entrainment, but they do tend to eliminate it more rapidly. They promote coalescence and junction between two gas bubbles of moderate size, in the liquid phase, to form a larger bubble which escapes more rapidly to the free surface where the bubble breaks and the gas is released. Photographs illustrating this point are shown as Fig. 10. The foam and air entrainment were produced by the mechanical means of pumping through a spray nozzle.

An exact theory to explain the destruction of foam is not established. The action appears to be entirely physical. At a later date it may be possible to publish a more complete account, including some very interesting information on anti-foam agents and their application to oil-foaming problems.

In addition to the application of anti-foam agents to engine oils, the practical elimination of foaming of gear oils has also been made possible. In the past the foaming of automotive gear lubricants has been severe, and particularly of lubricants in differentials where foaming caused loss of oil through the axle housing onto the brake bands, creating a dangerous condition. Application of anti-foam agents to transmission lubricants in trucks operating over long hauls at high speed has also eliminated loss of oil by foaming.

The use of anti-foam agents is expanding rapidly to many types of lubricating oils, in all of which they appear to perform satisfactorily.

NEW BOOKS FOR THE REFINER

Plastics Text Sticks to Facts and Data; No Glamour

Plastics, Scientific and Technological, originally published in England, presents a strong, basically sound collection of scientific data and facts about the tremendous group of compounds and materials we rather loosely refer to as "plastics".

The author, H. Ronald Fleck, is an English scientist and has prepared what he terms "a critical survey of the literature and a correlation of scattered data . . . of value both to chemists in the industry and to those whose professional duties necessitate a knowledge of the science of "plastics."

Unlike many recent publications in this field, the book doesn't popularize or glamorize plastics. It is definitely a book of plain facts of interest primarily to technicians, chemists, and professional men seeking more than an elementary treatment of the subject.

Copies of *Plastics, Scientific and Technological* (325 pages, 5¾ x 8¾, stiff cloth cover, illustrated) can be obtained from the Book Department, NATIONAL PETROLEUM NEWS, 1213 West Third Street, Cleveland 13, for $6.50, postpaid.

N.F.P.A. Book Includes New, Revised Fire Codes

National Fire Codes for Flammable Liquids, Gases, Chemicals and Explosives, 1945, appears at a time when war demands for larger quantities of these materials are creating fire and explosive hazards of increasing magnitude. Recently published by the National Fire Protection Association, the book assembles for the convenience of the reader the many standards dealing with these hazards. It supersedes the 1943 edition of the same title, and contains up-to-date information on new chemicals and solvents used in war industries, including information on their fire hazard properties and the best method of fire extinguishment. In addition, there are six new or revised codes.

This new volume is divided into nine parts as follows: Flammable Liquid Storage and Handling; Oil and Gasoline Burning Equipment; Liquefied Petroleum Gases; Utilization of Flammable Liquids; Gases; Refrigeration and Fumigation; Explosives and Nitrocellulose Materials; Tables of Properties—Hazardous Chemicals, Flammable Liquids; Flash Point Tests.

Copies of the 1945 edition of *National Fire Codes for Flammable Liquids, Gases, Chemicals and Explosives* (592 pages, 6 x 9 in., cloth cover) may be obtained from the Book Department, NATIONAL PETROLEUM NEWS, 1213 West Third Street, Cleveland 13, for $3.00 postpaid.

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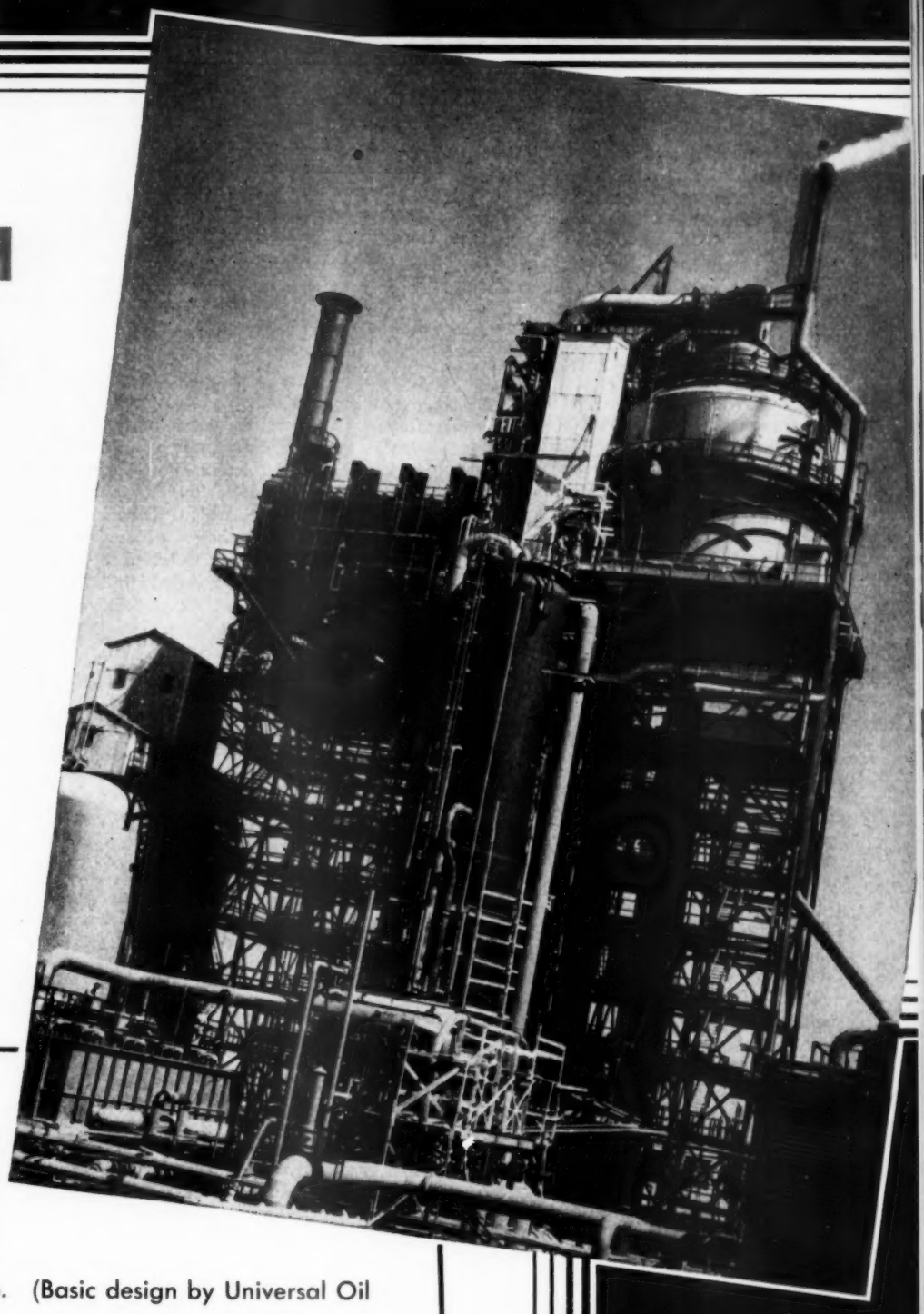

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Mechanical Operation of HF Alkylation Units

(*Continued from p. R-328*)

fluoric acid service, specially-coated plug valves should be used in all places where positive closure is absolutely essential. In other locations, gate and globe valves may be used. Safety considerations make it desirable to use double block valves with a bleed valve between them in positions where it may become necessary to isolate a piece of equipment completely in order to repair it.

Operation of Gate and Globe Valves

Gate and globe valves have been considerably less widely used in hydrofluoric acid service than plug valves, and consequently there is less accumulated experience regarding them. However, the present trend is toward replacement of plug valves in many services with globe and gate valves, particularly in sizes below 2 in. Gate and globe valves used in HF service should be of the outside screw type and should have Monel trim, i.e. stem, seat, stem bushing and disc. Otherwise there is a considerable tendency for the stem to stick in the bushing due to scale formation, making the valve inoperative, or for the valve to leak considerably.

Present evidence, while still incomplete, points to the conclusion that Monel-trim gate and globe valves will give satisfactory service with very little attention. However, iron fluoride scale particles can still cause difficulty with positive closure.

One minor operating problem has been occasioned by any small leakage of acid around the packing. Contact with moisture on reaching the atmosphere has resulted in heavy corrosion of stems. This difficulty can be overcome by the use of Monel stems.

Similar considerations apply to control valves. To overcome sticking it is frequently necessary to increase the clearance between stem and guide.

Corrosion of Equipment in General

Corrosion of equipment has not proved to be a major problem in operation of HF alkylation units. Metal loss has been very small except in the reboiler section of the acid rerun column where dilute acid-water phase is removed mixed with acid soluble oils. The remainder of the equipment in an HF alkylation unit is in concentrated acid service.

Vessel walls in particular have proved to be free from corrosion. Aside from the acid rerun unit where temperatures are high (150-200° F.), carbon steel vessels have shown no thickness loss at all in over 17 months service. In the acid rerun vessels, also carbon steel, loss in wall thickness has ranged from 0.00 to 0.02 in. per year. Acid-carrying lines have lost somewhat more metal than have vessels, about 0.01 to 0.03 in. per year although these lines operate cold. Internal equipment in acid rerun fractionators has shown the greatest loss, bubble decks, cascade trays, etc. showing 0.030 to 0.045 in. per year. Some of the carbon steel bubble caps in the acid rerun tower were badly corroded while others were not. The evidence to date is that there is no corrosion of carbon steel where temperature and turbulence are both low and that there is appreciable, but not serious, corrosion under conditions of high temperature and turbulence.

The above corrosion rates, based on one Phillips unit, may be subject to some variation with alkylation conditions. Corrosion in the first six months at another unit was at an even lower rate. Carbon steel bubble caps in the acid rerun tower, a point of maximum corrosion, showed no detectable loss in thickness. This low corrosion rate is thought to be due to a lower rate of water introduction into and consequently also of water removal from, this particular unit.

At the points of higher corrosion rate in the acid rerun unit, Monel can be used to minimize corrosion. Monel bubble caps in the acid rerun tower show no sign of corrosion. Monel linings, however, have proved very difficult to install free of minute cracks or leaks. Monel-clad steel is recommended instead of a welded lining.

The above considerations apply to concentrated acid service. The only section of the plant handling dilute acid is the lower part of the acid rerun tower and its reboiler. Here corrosion has been much less than was expected by corrosion tests, possibly due to an inhibiting action of the oils which are removed along with the water. The actual corrosion rate in this section depends very largely on the amount of water which is allowed to enter the alkylation unit along with the feed or otherwise. If no water enters, practically no corrosion would be expected in the acid-oil leg. Carbon steel can be used in this section if water removal is not great. At one unit, no corrosion was observed after six months operation of the acid-oil leg.

Monel-clad steel is recommended for this service, however, since it is probable that at some time in the operation of any plant water might have to be removed from the acid in quantity. Monel linings have not proved satisfactory. Any minute crack causes accelerated corrosion of the steel underneath the lining. In one case, steel under a lining corroded 0.312 in. while an unlined portion of the same vessel corroded 0.062 in.

Specific Points of Possible Corrosion

While general corrosion is so low as to constitute no serious problem, experience has indicated certain points where attention to design details is necessary to avoid localized corrosion.

(1) **Floating Head Type Condensers**— This type of condenser construction is a possible source of trouble since any trace leak at the gasket or tube rolls will gradually enlarge itself due to seepage of traces of hydrofluoric acid into the water. U-tube construction with seal welding at the tube sheet is probably the most trouble-free.

(2) **Steam Preheater Tubes** — Failure has been experienced after only a month or two of service by localized corrosion of tubes in preheaters, when acid flow was through the shell and steam flow through the tubes. This is thought to be caused by accumulation of a phase high in water content at a point which may vary depending on the design of the exchanger. Preheaters where acid flows through the tubes have not been subject to this type of failure. It is considered better design to use downflow of acid through preheaters to preclude possibilities of localized water concentration conditions.

(3) **Steam Preheater Tube Sheets**— Heavy corrosion has been experienced on the acid side of tube sheets in preheaters, the rate varying from 0.06 to 0.18 in. per year. This rapid corrosion does not cause a serious operating problem in this particular location. However, replacement of preheater tube bundles will eventually be required as a result of continued corrosion at this rate.

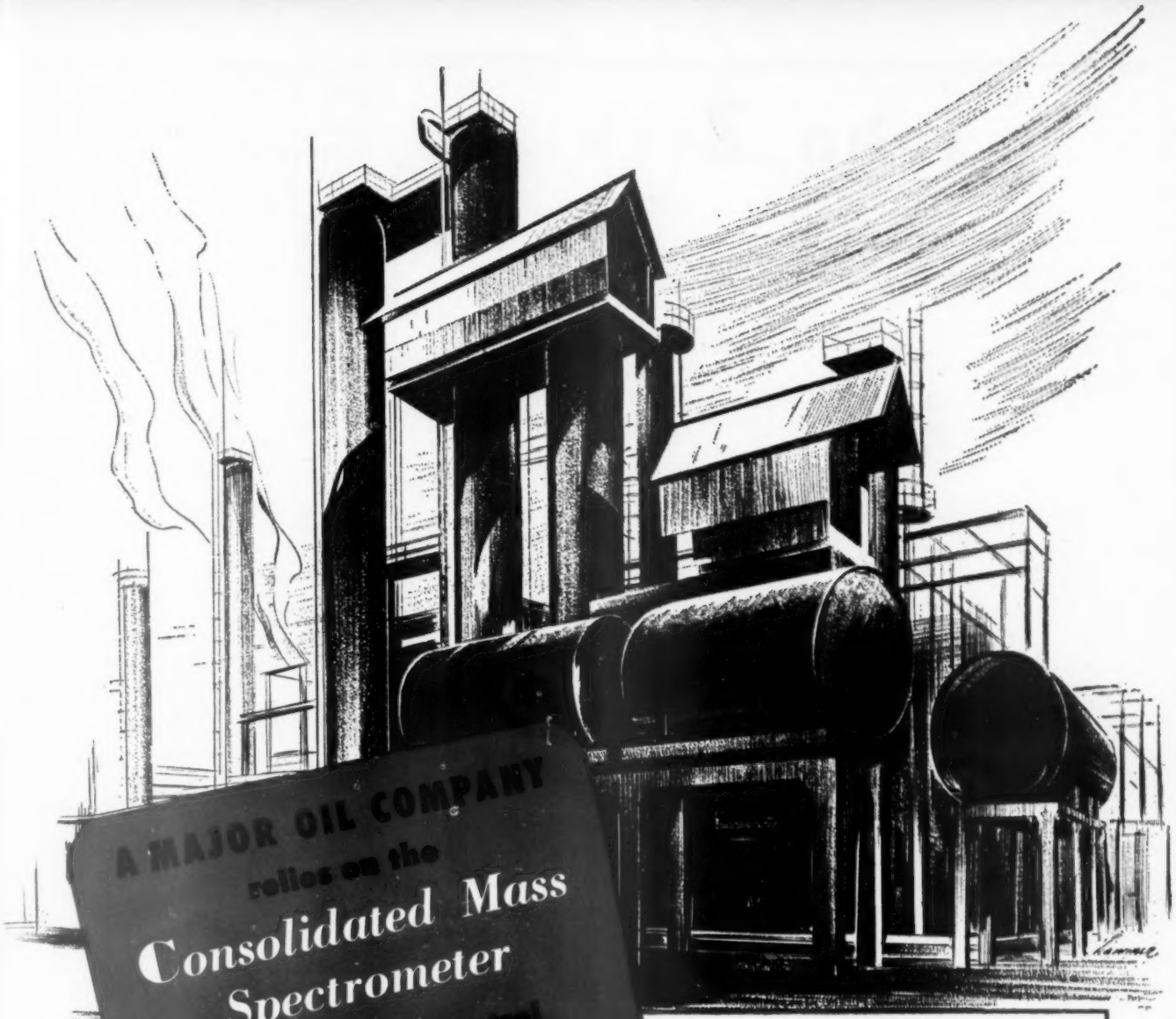
Instrumentation for HF Service

Control equipment for acid service was originally selected with a view to minimizing the number of stuffing box connections required. No pressure lines carrying acid were extended remotely from their source of pressure.

Liquid level indicators, recorders or controllers of the torsion tube type using volumetric displacement floats are preferred. This type of instrument has given good service. No corrosion has been observed after nearly a year and a half in operation. Scale formation takes place on all steel parts in contact with acid, and consequently Monel is recommended for floats and internal trim, and Inconel for the torque tube.

Flow recorders and controllers have been used with electrically transmitting type manometers and with "anaeroid-type" transmission. These have worked satisfactorily for periods of a year or more. Some sluggishness in the electrically-transmitting type is encountered after lengthy periods, caused by scale formation in the laminations of the armatures. Armatures have been sealed with paraffin wax to prevent this. Corrosion of the bellows of the "anaeroid type" has been observed after slightly more than a year's service and corrosion of armature tubes in the electrically-transmitting type has also been encountered after somewhat longer periods.

Pressure indicators and recorders for remote locations have been installed with volumetric pressure transmitters at the



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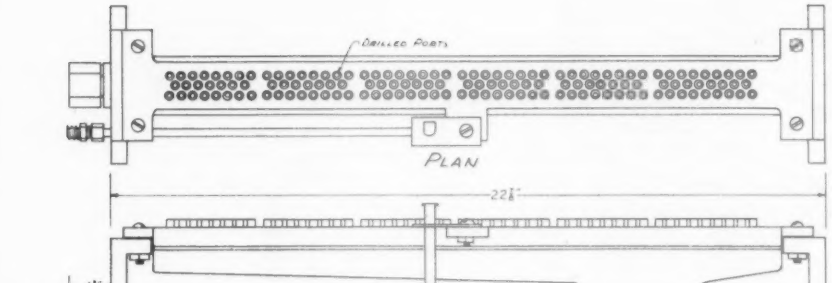

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site and pneumatic transmission of the impulse to the instrument. These volumetric transmitters have been entirely satisfactory. Some 18-8 stainless steel diaphragms, which had been in service for a year, were inspected and found in good condition. Monel, however, is recommended for diaphragms in contact with acid.

Locally-mounted pressure gauges of conventional type have been used with 18-8 stainless steel bourdon tubes. Service of these instruments has been satisfactory, although some of the tubes may become plugged after a year or more.

In general, very little difficulty has been experienced with operation of instruments in hydrofluoric acid service.

Conclusions

The majority of the mechanical operating problems of HF alkylation have been solved satisfactorily and a considerable body of experience is now available to guide the designer of plants using this acid. The main principles to be taken into consideration include:

(1) Allowance for scale formation on steels.

(2) Allowance for breakage of steel bolts and other small steel parts after prolonged contact with hydrofluoric acid.

(3) Care in design because of the lack of completely satisfactory packing materials.

Assuming satisfactory design and care in operation, an HF alkylation unit is one of the safest and most trouble-free of refinery units.

TECHNICAL MEETINGS FOR OIL MEN

In response to recent government requests, many technical societies have cancelled or postponed their usual annual and semi-annual meetings. To the extent that we have the information available, the listings below give the meetings which had already been scheduled and their present status.

MAY

9-11, Amer. Oil Chemists Society, New Orleans, La. **(Cancelled)**

11-12, Amer. Institute of Chemists, Deshler-Wallick Hotel, Columbus, Ohio.

16-17, Society of Automotive Engineers, Diesel Fuel and Lubricants Meeting, Hotel Carter, Cleveland. **(Cancelled)**

21-23, Amer. Gear Manufacturers Association, The Homestead, Hot Springs, Va. **(Cancelled)**

JUNE

18-21, Amer. Society of Mechanical Engineers, Semi-Annual Meeting, Chicago. **(Postponed)**

18-22, Amer. Society for Testing Materials, 48th Annual Meeting, Hotel Statler, Buffalo.

SEPTEMBER

10-14, Amer. Chemical Society, Annual Fall Meeting, Chicago. (ACS has cancelled its regular Spring meeting.)

(No date), National Lubricating Grease Institute, Edgewater Beach Hotel, Chicago.

OCTOBER

15-23, Amer. Society for Metals, Philadelphia **(Tentative)**

Increasing Propane Recovery in Existing Natural Gasoline Absorption Plants

By F. W. Bell

Practical methods by which increases in the extraction of propane can be obtained in existing natural gasoline plants are described:

(a) By using a lighter absorption oil to increase the molal oil/gas ratio.

(b) By applying refrigeration to the oil, rich gas or both to reduce the absorption temperature.

(c) By recycling stabilizer bottoms to the still final condenser to reduce or eliminate still vapors.

(d) By control of the de-ethanizing column for the maximum retention of propane. A method for such control is described.

BECAUSE of the continued interest in propane as a substitute for butane in liquefied petroleum gas and as an intermediate in chemical conversion processes, it is appropriate to consider methods by which its recovery can be increased in existing gasoline absorption plants. In a previous paper presented before the California Natural Gasoline Assn. Henry Wade[1] presented an excellent discussion of the principles involved in the design of new plants for high propane recovery. These same principles apply to obtaining an increase in propane extraction in existing gasoline plants.

The problem may be considered in two phases—one, increasing the extraction of propane in the absorber rich oil; the other, retaining the propane thus recovered in the distillation and fractionation sections of the plant.

When considering means available for increasing propane extraction in the absorber, it is convenient to use the absorption factor as a basis. This may be defined as follows:

$$A = L/KV$$

where A = absorption factor,
L = rich oil from absorber in mols per unit time,
V = rich gas to absorber in mols per unit time,
K = equilibrium constant for component under consideration, in this case, propane, at absorber pressure and temperature.

Inspection of the absorption factor equation makes it obvious that an increase in the mols of rich oil, usually obtained by increasing the lean oil rate, or a decrease in the equilibrium constant, will result in an increase in the absorption factor, assuming the vapor rate is to be held constant. More simply, this means that an increase in the extraction of propane can be obtained by increasing the molal oil/gas ratio or decreasing the equilibrium constant.

An increase in the molal oil/gas ratio may be obtained in two ways—one, by using a lighter oil giving more mols per gallon of oil circulated; the other, by increasing the actual volumetric circulation rate. In an existing plant it may be quite expensive to increase the actual volumetric flow rate, since it would probably require new lean oil pumps, additional exchanger surface, and possibly revamping of the absorption and stripping columns.

On the other hand, it may well be possible that a lighter absorption oil could be used in the existing equipment without increasing the vapor pressure of the lean oil to the point where lean oil loss becomes excessive. A summary of calculations made to illustrate the effect on propane extraction of increasing molal lean oil flow with fixed gas rate by the two methods mentioned is presented in Table 1.

These calculations were made for an existing plant in which the butane extraction is fairly low, only about 78% in the absorber. By inspection of the table it will be seen that a reduction of the lean oil mol weight from 170 as used in the plant at present, shown in Case I, to 150, as shown in Case II, will result in an increased propane extraction of 666 gal. per day, or 8.6%. The calculations summarized in Case III were made to demonstrate the effect of an increase in volumetric lean oil rate for the original lean oil that would be required to obtain the same molal oil rate as in Case II.

For a 10% volumetric increase in the original lean oil, the same molal oil rate will be obtained as with the lighter oil, but the pounds of oil circulated will be materially increased, thus resulting in a somewhat lower absorption temperature due to the greater heat capacity of the lean oil. The 10% increase in volumetric lean oil rate gave an increase in propane extraction of 874 gal. per day, or 11.3%. Since we are interested, in this paper, only in methods for obtaining an increase in propane recovery, we will not discuss in detail the effect of these changes on butane recovery, but should call to your attention the fact that an increase in butane extraction also resulted. In plants that are already obtaining high butane recovery there would be no material change in the butane extraction by these small changes in lean oil rate.

No attempt has been made to evaluate the increase in absorption oil loss when using the lighter lean oil, since it is quite possible to use a narrower boiling range oil with a lower endpoint without materially increasing the vapor pressure of oil from the still. In actual fact, it is likely that the use of a lighter oil may make

TABLE I—Effect of Increased Molal Oil Rate on Propane Extraction

Absorber Pressure—135 psig
No. of Theoretical Trays—12
Temperature of Lean Oil—80° F
Temperature of Wet Gas—80° F

	—RICH GAS—		—RICH OIL COMPOSITIONS—					
			—Case I—		—Case II—		—Case III—	
	Mols/Day	Mol %	Mols/Day	Mol %	Mols/Day	Mol %	Mols/Day	Mol %
CO_2	2,378	5.71	77	.50	85	.50	85	.50
C_1	31,933	76.67	617	3.99	675	3.97	690	4.04
C_2	2,772	6.66	281	1.82	306	1.80	314	1.84
C_3	2,504	6.01	744	4.81	808	4.75	828	4.85
C_{i4}	351	.84	222	1.44	240	1.41	246	1.44
C_4	920	2.21	773	5.00	814	4.79	834	4.88
C_{5+}	792	1.90	792	5.12	792	4.66	792	4.64
Lean Oil	....	....	11,954	77.32	13,290	78.12	13,291	77.81
Total	41,650	100.00	15,460	100.00	17,010	100.00	17,080	100.00
Lean Oil Rate, g.p.m.			205		205		228	
Lean Oil Gravity, °API			40		43.3		40	
Lean Oil Molecular Weight			170		150		170	
Absorption Temp., °F			102		103		101	
Dry Gas Outlet Temp., °F			84.6		84.9		85.1	
Propane Increase, %			0		8.6		11.3	
Propane Increase, Gals/D			....		666		874	

NOTES: Case I is the original design basis.
Case II illustrates the use of a lighter lean oil.
Case III illustrates the increase in volume rate of original lean oil required to obtain same molal oil rate as in Case II.

This paper was presented before the California Natural Gasoline Assn., Downey, Cal., April 5, 1945. *F. W. Bell is Chief Process Engineer, The Fluor Corp., Ltd., Los Angeles*

it possible to obtain a greater volumetric circulation with the existing equipment, as the oil will have a lower viscosity, thus resulting in less pressure drop through the exchanger and lines.

It should also be pointed out that the use of a lighter oil would result in fewer pounds being circulated per unit volume so that the exchange equipment could easily handle the increase in volumetric oil rate up to the point where the weight of oil circulated equaled the original weight of oil. The problem of selection of absorption oil should always be given very careful consideration, both in existing plants and in the design of new plants.

The equilibrium constant may be decreased either by increasing pressure or decreasing temperature. In existing plants it is not ordinarily practical to increase the absorption pressure, so that we will consider only means for reducing the absorption temperature. This may be done by refrigeration applied to the lean oil, rich gas, or both. The distribution of cooling between the oil and gas should be carefully studied since it is possible to cool the oil too much without also cooling the gas. Consideration must be given to the heat of absorption, heat capacity of the oil and heat capacity of the gas to determine the proper distribution of cooling between oil and gas. Each case must be considered individually. A summary of calculations made to illustrate the effect of refrigeration on propane extraction is presented in Table 2.

The same absorption case was used in preparation of Table 2 as in Table 1. It was assumed that the oil or gas could be cooled to 60°F. from an original temperature obtained with water of 80° F. In all cases it was assumed that the volumetric lean oil rate would be held constant at 205 GPM with a rich gas rate of 41,650 mols per day. Case I illustrates the absorption obtained with water cooling only. Case II illustrates the effect of cooling the oil only. The propane extraction increased 880 gal. per day, or 13.8%. Case III illustrates the effect of refrigeration of the gas only to 60° F., resulting in an increase in propane extraction of 541 gal. per day, or 7%. Case IV illustrates the effect of refrigerating both the oil and gas to 60° F., resulting in an increase in propane extraction of 1653 gal. per day, or 21.4%.

Since it is possible to use a lighter lean oil because of the lower temperature at the top of the absorber resulting in a lower partial vapor pressure of the oil at this point, it is desirable to include calculations showing the effect of combining a lighter lean oil with refrigeration. Case V illustrates the use of 150 mol weight oil in place of 170 mol weight with the lean oil only refrigerated to 60° F., giving an increase in propane extraction of 1748 gal. per day, or 22.6%. Case VI illustrates the use of the lighter lean oil with refrigeration of both gas and oil to 60° F., resulting in an increase in propane extraction of 2579 gal. per day, or 33.3%.

Temperature Limited

It should be pointed out that the temperature to which the streams can be refrigerated is limited by the point of hydrate formation. There are several references giving data on hydrate formation conditions, among which are Katz[2] and Bechtold[3]. Bibliographies included with these papers give practically complete coverage of the literature on hydrocarbon hydrates.

The equilibrium constant can also be reduced by using intercooling to obtain a reduction in the absorption temperature where the temperature rise without intercooling exceeds 15 to 20° F. No calculations are presented covering the use of intercoolers, but it should be pointed out that where intercoolers are used it is important that they be properly located in the absorber and that the oil circulation be maintained in order to increase the extraction of propane. The location of the intercoolers is a function of the gas-oil ratio which affects the temperature gradient in the absorber. In general it is difficult, from a mechanical standpoint, to add intercooling to existing equipment.

Another way in which the propane extraction may be increased is by the addition of trays in the absorber or by improving the tray efficiency of existing absorbers. Increasing the number of absorption trays is effective on propane extraction only where the absorption factor is between approximately 0.6 to 2.0, depending on the number of theoretical trays in the existing absorber. This may readily be understood by reference to the Brown[4] absorption factor diagram. Revamping or addition of absorber trays is a somewhat expensive and mechanically difficult task in an existing plant.

The next phase to be considered in the problem of increasing propane recovery in existing absorption plants is the retention of the propane in the distillation and fractionation steps. Since every plant will differ in the matter of venting and stripping of the rich oil, these problems must be considered for each individual plant by someone competent to make the necessary process study. The main problem is to determine how best to dispose of the increased pickup of methane and ethane in the rich oil necessarily resulting with the increased propane extraction. The still vapor may be recycled to the main absorber or reabsorber, compressed and condensed, or compressed direct to the stabilizers. The amount of the still vapors may be materially reduced, or even entirely eliminated, by the use of stabilizer

TABLE II—Effect of Refrigeration of Oil and Gas to Absorber on Propane Extraction

	—RICH GAS—		Absorber Pressure—135 psig; No. of Theoretical Trays—12; RICH OIL COMPOSITIONS											
			—Case I—		—Case II—		—Case III—		—Case IV—		—Case V—		—Case VI—	
	Mols/Day	Mol %	Mols/Day	Mol %	Mols/Day	Mol %	Mols/Day	Mol %	Mols/Day	Mol %	Mols/Day	Mol %	Mols/Day	Mol %
CO_2	2,378	5.71	77	.50	84	.53	81	.52	88	.55	90	.52	96	.55
C_1	31,933	76.67	617	3.99	669	4.24	652	4.17	698	4.38	725	4.19	767	4.38
C_2	2,772	6.66	281	1.82	316	2.00	299	1.91	333	2.09	339	1.96	366	2.09
C_3	2,504	6.01	744	4.81	847	5.37	796	5.09	903	5.67	912	5.27	992	5.67
C_{41}	351	.84	222	1.44	256	1.62	241	1.54	279	1.75	274	1.58	302	1.73
C_4	920	2.21	773	5.00	855	5.42	821	5.25	884	5.55	878	5.07	903	5.16
C_{51+}	792	1.90	792	5.12	792	5.02	792	5.06	792	4.97	792	4.58	792	4.53
Lean Oil	...	...	11,954	77.32	11,956	75.80	11,956	76.46	11,953	75.04	13,290	76.83	13,282	75.89
Total	41,650	100.00	15,460	100.00	15,775	100.00	15,638	100.00	15,930	100.00	17,300	100.00	17,500	100.00
Temp. Gas in, °F			80		80		60		60		80		60	
Temp. Gas out, °F			84.6		68.3		78.5		64		65.9		62.5	
Temp. Oil in, °F			80		60		80		60		60		60	
Temp. Oil out, °F			102		92		97		86		94		86	
Absorption Temp., °F			102		92		97		86		94		86	
Lean Oil Rate, g.p.m.			205		205		205		205		205		205	
Lean Oil Gravity, °API			40		40		40		40		43.3		43.3	
Lean Oil Mol Weight			170		170		170		170		150		150	
Propane Increase, %					13.8		7.0		21.4		22.6		33.3	
Propane Increase, Gals/D					880		541		1653		1748		2579	

NOTES: Case I—The original design basis. Oil and gas in at 80° F.
Case II—Lean oil only refrigerated to 60° F.
Case III—Rich gas only refrigerated to 60° F.
Case IV—Lean oil and rich gas both refrigerated to 60° F.
Case V—Lighter oil used with same volume rate as before. Lean oil only refrigerated to 60° F.
Case VI—Same as Case V, with rich gas and lean oil both refrigerated to 60° F.

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bottoms recycle[5] to the still final condenser.

It should be noted, however, that stabilizer bottoms recycle is effective only where the vapor pressure of the stabilizer bottoms product is considerably less than the vapor pressure of the still overhead product. This means that in general the still accumulator pressure must exceed 50 psig for effective use of stabilizer bottoms recycle. One point which might be overlooked when attempting to use stabilizer bottoms recycle is that it is necessary to obtain thorough mixing of the recycle liquid with the still product vapor in the condenser, which requires that the condensers, where atmospheric, be of the upflow type, or where shell and tube to give the necessary mixing by effective baffling.

It is often desirable to recycle only a sufficient amount of the stabilizer bottoms to prevent the still overhead vapor from building up a high internal cycle through the absorption step. Where stabilizer bottoms recycle is used to reduce or eliminate recycle vapors to the absorbers the advantage is two-fold, since it reduces or eliminates recompressor horsepower and makes the lean oil available for primary absorption of the plant inlet streams rather than secondary absorption of recycle gas.

The final point to be considered is retention of the propane in a de-ethanizer column. This is another place where refrigeration should be considered, because it is possible to reduce the amount of propane loss required for the production of reflux for this column by reducing the condensing temperature. The temperature to which the deethanizer overhead vapor may be refrigerated is again limited by the hydrate formation temperature. The use of refrigeration at this point should be studied from a profitability standpoint.

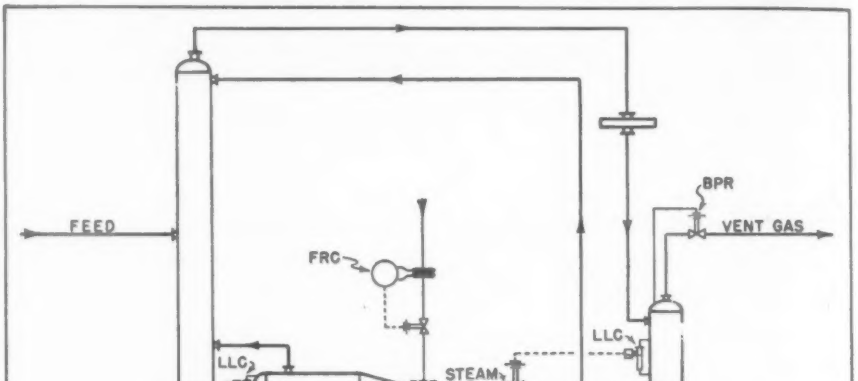

Fig. 1—De-ethanizer control instrumentation for maximum propane retention

One more thing that should be considered in connection with the de-ethanizer is the method of control to be used for maximum retention of propane. This is illustrated in Fig. 1, in which is shown a flow rate controller on the steam to the reboiler to obtain constant heat input with a liquid level controller on the reflux accumulator controlling the reflux returned to the column so that all liquid condensed in the overhead condenser will be returned as liquid to the column. By the use of constant heat input to the column to obtain the desired stripping of ethane from the bottoms with a return of all liquid formed in the overhead condenser maximum retention of propane is obtained regardless of cooling water temperatures.

To summarize the problem of increasing propane recovery in existing gasoline absorption plants, there are four things that can be done without making expensive or radical changes and with a minimum of shutdown time. These are:

(a) Use of a lighter absorption oil.
(b) Use of refrigeration on the lean oil and rich gas and de-ethanizer overhead.
(c) Use of stabilizer bottoms recycle to the still final condenser.
(d) Use of the de-ethanizer control method as described.

All of the methods should be given careful study to determine their economic feasibility before making any changes in a plant.

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Better Plant Performance Is Goal Of Refinery Technical Division

THE Technical Division at the Baton Rouge refinery of Standard Oil Co. of N. J., Louisiana Division, was organized in 1931 to insure production of the best possible products in the best possible manner throughout the entire refinery.

Fundamental concern of its members is to obtain facts, and, when they have those facts before them in their true light, to co-ordinate them with other information to solve problems that have arisen in connection with the refinery's operations.

At present the Technical Division is composed of five units, as follows:

Process Engineers — who determine which one of the various processes that can be used for any type of operation is the most efficient and effective.

Inspection Department—whose members, through inspection and testing of the refinery's physical equipment, keep the plant operating continuously and safely.

Refinery Laboratory—which analyzes and checks all products manufactured in the refinery (both in their final form and while still being processed) to see that they meet or surpass specifications.

Process Control, Laboratory and Engineers—whose members attack the problem of improving operations and products, the same goal aimed at by the Refinery Laboratory and Process Engineers units, from the operators' viewpoint.

Chemical Technical Service—responsible for planning methods to develop and increase the output of the refinery's Chemical Products units.

Detailed descriptions of the duties and responsibilities of each of these five units follow:

Process Engineers

Which of the five units and its fact-finding functions should be described first is unimportant; for convenience, let us consider the Process Engineers. This unit is assigned a large variety of problems and its 20 engineers have a wide range of experience in refinery operations and in handling design, economic, and financial problems which are involved in planning and carrying on these operations.

There may be from two to 20 alternate ways of doing a given process. Process I may be more economical in operation than Process II, but Process II may yield the best results in finished product. Process III may combine the best features of the first two, but may develop a quirk in the last phases of operation, which may be ironed out if Process IV is developed. And so on. Upon the department rests the responsibility of determining which process has the greatest value, whether that value be considered in terms of additional production of war products, economies achieved in reduced consumption of chemicals and utilities, or in the realization of improved yields or product quality.

During the war, emphasis has been placed on the production of material for our armed services. The Process Engineers have contributed invaluable service to this production accomplishment and have developed many plans for utilizing refinery equipment in the war effort.

One of the department's outstanding achievements was the setting up of process plans for two catalytic cracking units and other equipment involved in the aviation gasoline program which was undertaken just after Pearl Harbor. The plans were adjusted throughout the construction period to take advantage of new information from the laboratories and plants as it became available to the Process Engineers.

Inspection Department

Members of the Inspection department are, in effect, a board of examiners of the refinery's physical equipment. There are, of course, many different phases of inspection work, but they are all directly or indirectly associated with the major aim of keeping the equipment operating continuously and safely.

The refinery's new construction during the past several years has called for much important activity on the part of the Inspection Department. This work has involved following the fabrication and erection of the new equipment to see that the operating and storage units are up to specifications. For example, some of the newer units employ the use of extremely low temperatures, such as —150° F. The inspection engineers have checked these carefully to see that nothing but the special alloys required where sub-zero temperatures are expected have been used.

The study of corrosion and erosion forms a vital and interesting part of the department's work. A certain amount of corrosion must be expected where equipment is subjected to hydrocarbons, and continuous testing of metal and alloy combinations is conducted by the department to establish relative corrosion resistance of different metals. This is done by installing test samples of ferrous and non-ferrous alloys in the operating units.

When the No. I phenol plant was first placed in operation, the inspectors were faced with a very serious corrosion from the phenol under certain temperature conditions. Ordinary carbon steel would last only a few weeks in some parts of the unit. Testing disclosed that 18 Cr-8 Ni alloy steel would resist corrosion—in fact, was practically impervious to it. As a result, this material was installed in the critical locations throughout the unit and the operating interval between scheduled inspections was increased from six to 24 months.

Inspection of the approximately 6000 safety valves in service throughout the plant is considered one of the department's more important routine activities. Routine, but of considerable magnitude, for each valve is periodically removed from the unit and sent to the safety valve shop for inspection and testing. A complete history of each valve is maintained as a part of the departmental records.

Since welding is used extensively throughout the plant for all types of high and low pressure equipment, the task of inspecting this work requires a great deal of the department's attention It assists the refinery welders in developing techniques for work on all types of metals and alloys, and conducts rigid tests on all work done by both refinery and contractors' welders.

Refinery Laboratory

Members of the Refinery Laboratory group, the largest in the Technical division, might be called the customers' representatives at the refinery. They see to it that all merchandise offered for sale by the company is as good as or better than requirements under rigid specifications.

Samples of all products, from 100-octane aviation gasoline down to asphalt, must undergo the tests of the Refinery Laboratory technicians before they are released for shipment.

Assisting in the control of blending operations is considered one of the most important services of this group, since close control of blending is necessary to obtain optimum use of the various components and a larger production of the more valuable products—100-octane aviation gasoline, for instance. Each gallon of this important product must meet requirements with regard to lean and rich mixture, octane number, distillation, vapor pressure, tetraethyl lead, etc., and it is not possible to "give away" quality at one point to meet requirements in another, since to do so would ultimately result in fewer gallons being produced.

Recognized as one of the best-equipped and best-qualified laboratories of its type in the country is the knock-testing section of this unit. Its test engines and auxiliary facilities assure that the aviation gasoline shipped from Baton Rouge Refinery is really 100-octane, and other equipment is available for proper testing of motor gasoline, diesel fuel, tractor fuel, and marine distillate.

Routine inspections of stream and tank samples of products from each of the refinery processing units are inspected to assure that each unit performs its own job well and that the partly finished products passed on to succeeding units are satisfactory for further processing. To recognize from a few simple tests how well a particular unit is performing

The major portion of the accompanying article originally appeared in the March 2, 1945, issue of "The Stanoclan," employee publication of the Louisiana Division of the Standard Oil Co. of Louisiana, and was written by F. B. Labue, of that company.

requires a high degree of skill on the part of the laboratory personnel.

Process Control

The Process Control group is the technical unit normally closest to the operators. Composed of Process Control engineers and the Process Control laboratory workers, the group works from a different approach towards the same goal as the Refining Laboratory and the Process Engineer departments—the improvement of operations and the improvement of the quality of products.

This does not mean that the work of the group overlaps. It means, rather, that the solution of process problems at the refinery is expedited when two or more groups of technicians, highly trained in different fields, can investigate problems with the skills of their respective sciences, compare conclusions, and confer on recommendations. For example, we find that the Process Control Laboratory group is concerned with projects already mentioned in connection with other departments—the development of improved methods of finishing aviation and motor gasoline, the reduction of corrosion of plant equipment.

The reduction of the volume of refinery waste and the development of satisfactory methods for recovering oil from waste streams is a project on which the laboratory has done a considerable amount of experimentation.

In a program now under way, control engineers are trying to determine the optimum operation for catalytic cracking units in order to insure production of a greater quantity of 100-octane aviation gasoline. The tests are elaborate and difficult, since each feed and product stream must be measured and sampled. The samples are submitted to finishing procedures simulating those achieved in the plant and are blended and inspected for determining finished product quality.

Control engineers also assist the Yield & Cost department in obtaining accurate yield figures on operating units, particularly those operating for the account of government agencies.

The work of the engineers brings them in close association with both the mechanical and operating groups. Often they work around the clock with the operators to discover some fault in a process which must be corrected. Thus they acquire a well-rounded training which is of value in future work which may well be in other departments.

Chemical Technical Service

The planning of methods to develop and enlarge the output of the Chemical Products and Plancor units is the main purpose of the Chemical Technical Service group. This technical group serves these units in the same manner that the Process Control engineers serve the refinery. It also handles process engineering designs for unit changes and minor additions in that area.

CTS is coordinating the construction activities for expanding each of the butyl plants, and performs similar services for other construction projects. More than 100 process specifications have been issued since Jan. 1, 1944, covering various unit changes and additions in the Chemical Products and Plancor areas.

The department conducts tests for determining the capacity and performance of the various units. This work has resulted in the location of a number of bottlenecks and in laying plans for their elimination.

CTS prepares regular reports giving detailed operating and engineering information on the Baton Rouge synthetic rubber plants, which reports are distributed to the industry for information and guidance in operating plants patterned after those at Baton Rouge. Special reports are prepared from time to time, particularly for the semi-annual meetings of the butyl rubber and the butadiene producers, which are sponsored by the Rubber Reserve company.

The department is currently working on plans for increasing the capacity of other units.

Industrial Lubrication

(*Continued from p. R-330*)

valve at 600° F. or above. Even at 600° F. the steam is hot enough to make lubrication difficult, and the repair bills will generally outweigh the calculated or theoretical economy of using steaming conditions of this order.

About 550° F. at the throttle valve is a more reasonable temperature, because it does not stretch the capabilities of cylinder oils to the limit. Even 550° F. will often be found on the high side, but for engines designed with two or more cylinders, where the steam expands progressively in each cylinder down to a low temperature in the low pressure cylinder, the initial high temperature is, of course, advantageous, because it reduces the final amount of moisture in the low pressure cylinder.

Q—What is the average temperature on a cylinder wall operating on superheated steam supplied at 250 psi pressure, and total temperature of 600° F.

A—If the cylinder is surrounded by a steam jacket, the average temperature would be at least 400° F. and possibly above. At these operating temperatures the oil film tends to leave the cylinder wall and roll up into little spheres, like water on a hot greasy frying pan.

Q—What is the average temperature on a high pressure cylinder wall operating on steam supplied at 250 psi pressure and not superheated?

A—The temperature of steam at this pressure would be about 400° F. dropping below 300° F. at the exhaust. Hence the average cylinder wall temperature would not be above 350° F. at the maximum, and there would be no problem in lubrication. In fact a medium viscosity cylinder oil would take care of this condition very easily, say 160 to 190 Saybolt sec. at 210° F.

Q—The boiler feed water in a plant generating steam at 200 psi contains five grains of oil per gallon. Would this amount of oil in the water going to the boilers be considered dangerous? Note. One grain per gallon equals approximately 17 parts per million.

A—Any answer to this question is rather controversial, but if the boilers were of the water tube type the answer would be "yes" without much chance of disagreement. Many low pressure boilers operate for years on boiler feed water containing an average of 10 grains per gallon in the feed water, or about 150 to 170 parts per million, but the practice is decidedly on the hazardous side. Comparatively inexpensive and simple feed water clarifiers and exhaust steam oil extractors are available which will reduce any type of oil in the condensate below 1 grain per gallon (17 parts per million) consequently there should be no reason for running risks with oil in the boilers. Even compounded cylinder oils may be extracted down to a safe limit of 5 or 6 parts of oil to a million parts water with proper equipment. Fresh water from the mains of a modern city contain about 5 to 10 grains of solid matter per gallon. This material consists of various calcium and silica compounds etc. which generally amount to about 8 or 10 different combinations. The water may be treated before it enters the boilers to remove these solids but the most common practice is to use boiler compounds which reduce this material to sludge. This sludge settles in the lowest part of the boiler from whence it is blown out at intervals.

Many boilers evidence no trouble from the entrance of oil because this sludging action no doubt takes much of the oil with it. However, sludge may form small nests on boiler tubes, plates, etc. and while they are normally harmless and drop off before any harmful overheating occurs, they are, nevertheless, vulnerable to the harbouring of oil because they are porous. If cylinder oil is able to enter the pores, and bind the nest to its anchorage, the mass bakes and becomes a hard crust and a permanent fixture. Eventually the crust prevents heat transfer, and the tube, or plate, starts to buckle or blister. This action may dislodge the nest but if it does not the section burns and weakens until an explosion occurs. Like all explosions, the results may be serious, or they may only result in a slight inconvenience.

The blowing of boiler tubes, blistering of plates, and so on, can of course occur without a drop of oil in the boilers. However, there is no sense in courting one more hazard by allowing excessive quantities of oil to enter the boilers.

There may be readers who have valuable opinions to offer on this question.

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Dual-Fuel Diesel Engines Use Either Gas or Oil

Fuel Change-Over Can Be Accomplished Instantly Without Shutting Down and at Full Load. 20-25% Increase in Efficiency over Gas Engine Operation Is Claimed

THE need for an internal combustion engine which can use either gas or oil, or a mixture of both, as fuel without the necessity of an electrical sparking device has long been recognized, particularly around refineries, which at times have both fuels available in widely varying quantities.

Two Diesel engine manufacturers, The Cooper-Bessemer Corp. and Worthington Pump and Machinery Corp., have both recently announced the development of such a multi-fuel Diesel engine, capable of being converted easily and quickly from one fuel to the other.

Both engines operate on the highly efficient Diesel principle, and can be switched from one fuel supply to the other, or to a mixture of both, by a simple adjustment which can be made with the engine continuing to operate at full load. It is claimed that they operate as gas engines at 20 to 25% greater efficiency than the unusual gas engine.

Engines which could be operated on either gas or oil have been in use in the past. Conversion from one fuel to the other, however, has always necessitated shutting down the engine and replacing various key parts, requiring considerable time and involving expensive extra equipment. Both of these new engines eliminate this necessity.

No electrical ignition system is used on either of the two dual-fuel engines announced, an advantage in certain applications. This advantage is especially apparent around a refinery, where a stray spark from the ignition system may present a fire hazard. When the multi-fuel Diesels are used as gas engines, ignition of the fuel is secured by injecting a small quantity of fuel oil into each cylinder together with the gas; the oil ignites when the fuel-air mixture is compressed, the same as though the engine was operated as a Diesel, and serves as a pilot flame to ignite the gas portion of the fuel charge.

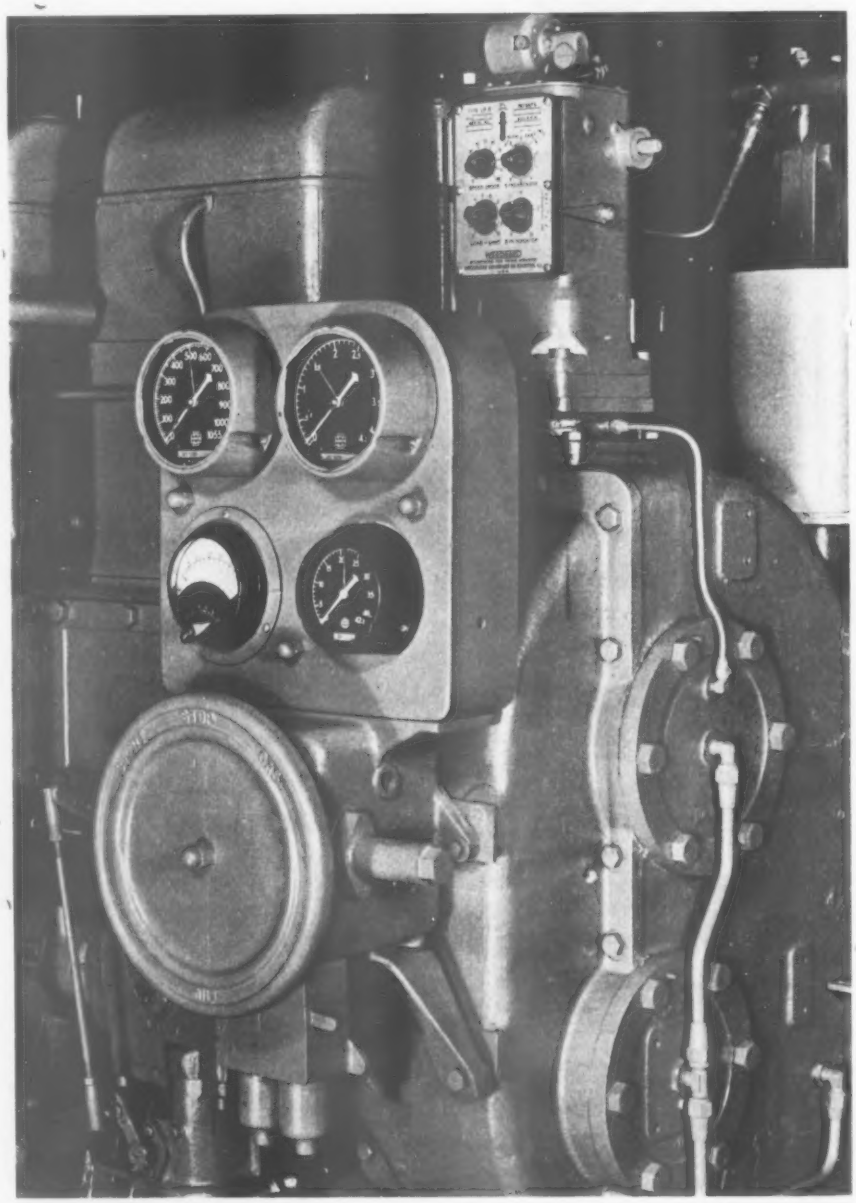
The development leading up to the burning of gas on the Diesel cycle can best be explained by comparing it with the normal spark-ignited engine operating on the Otto cycle.

The usual 4-cycle gas engine operates on the same general principle as the better known 4-cycle gasoline engine. A mixture of gas and air is made on the intake, the ratio of gas and air being held constant. The quantity of the mixture is varied in accordance with the load demand by throttling the intake. At full load, therefore, the intake manifold is under only a slight vacuum, while at no load it is under a high vacuum. The compression pressure depends upon the load, and at full load ranges from about 90 to 125 psi, depending upon the quality of gas. Ignition is always by means of spark.

Two-cycle gaseous-fuel engines operate on the same principle, except that inasmuch as the cylinder is scavenged with air the gas is not put into the cylinder until after the ports are closed. Therefore, on the 2-cycle engine the air quantity is constant, while the gas is varied, producing a mixture which is not of constant quality as is evidenced by the fact that the 2-cycle engine usually misses a great deal on the lighter loads.

The thermal efficiency of an internal combustion engine is a function of its compression pressure. For example, a 125-lb. compression engine usually results in about 10,000 Btu's per brake horsepower hour, while a 400-lb. compression engine usually produces a brake horsepower hour for about 7500 Btu's. It is, therefore, always desirable to keep the compression as high as possible.

On the Otto cycle engine, the compression is limited because of the danger of



Control end of a Cooper-Bessemer Diesel engine (type JS-8) showing the gas-oil operating mechanism. Change-over from oil to gas (or gas to oil) is accomplished at full load merely by turning the wheel in the left foreground to the proper position

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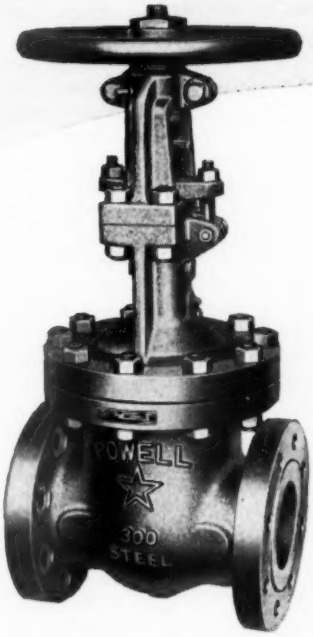

Fig. 3003—Class 300-pound Cast Steel Gate Valve, with flanged ends, outside screw rising stem, bolted flanged yoke and taper solid wedge.

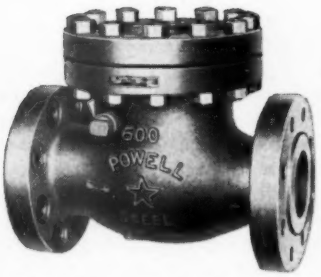

Fig. 6061—Class 600-pound Cast Steel Swing Check Valve, with flanged ends and bolted cap. Disc, when wide open, permits full, unobstructed flow through the valve body.

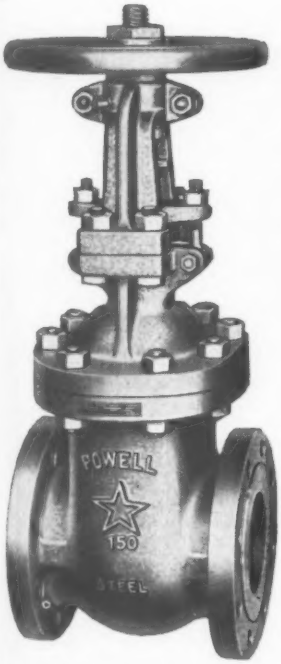

Fig. 1503—Class 150-pound Cast Steel Gate Valve, with flanged ends, outside screw rising stem, bolted flanged yoke and taper solid wedge.

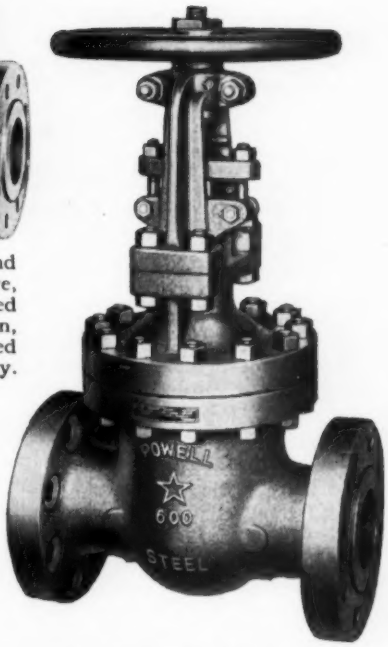

Fig. 6003—Class 600-pound Cast Steel Gate Valve, with flanged ends, outside screw rising stem, bolted flanged yoke and taper solid wedge.

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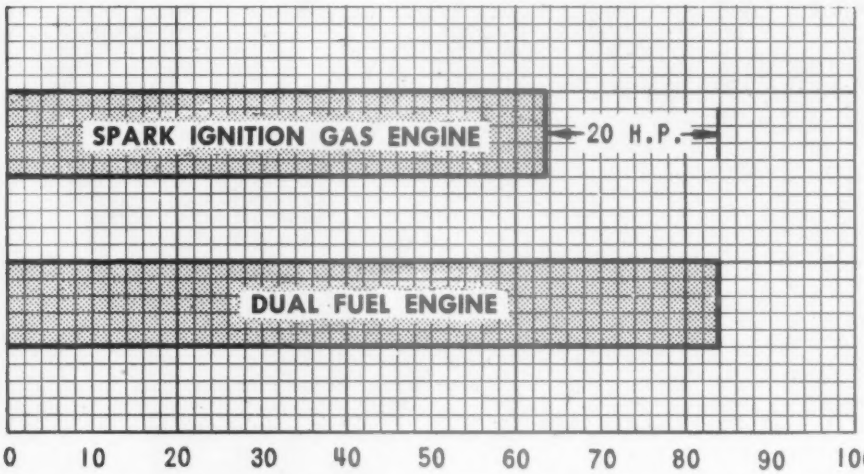

Fig. 1—Brake horsepower developed per 1000 cu. ft. of 600 Btu gas at full load. The dual fuel engine operating on gas is rated at 20 to 25% greater efficiency than the conventional spark ignited gas engine

premature ignition and must be held to the point where there is no chance of the mixture being ignited before the proper time. Therefore, the Otto cycle is limited to about 10,000 Btu's per brake horsepower hour, or an efficiency of about 25%.

Much higher compression is possible in the Diesel engine (usually from 500 to 700 psi), with a resulting increase in thermal efficiency to about 35%.

Because these new dual-fuel engines operate on the full Diesel cycle at all times, it is claimed that when used as gas engines they are from 20 to 25% more efficient than the conventional spark-ignited gas engine, as illustrated in Fig. 1.

Engineering details of both engines, as released by the respective manufacturers, are given below.

Cooper-Bessemer

Experimentation with the multi-fuel Diesel engine was begun by The Cooper-Bessemer Corp. back in 1927, according to Ralph L. Boyer, the company's chief engineer. Recently their efforts have been rewarded by the successful operation of a natural gas engine on the Diesel principle, which enables the unit to use a wide variety of fuels, including fuel oil, natural gas, manufactured and coke oven gases, sewage gas, and refinery by-products.

"In 1927," the company claims, "we had the idea of burning gas on the Diesel cycle. A single-cylinder test engine was built and operated on this cycle in 1928.

"Since it was not possible to go much beyond 125 lbs. compression with the regular line of gas engines, it was assumed that there was no chance of compressing the mixture to 400 lbs. for the Diesel cycle. It was arranged, therefore, to compress air only and then inject the gas on top dead center under very high pressure. The gas pressure actually used was about 1,000 psi.

"It was found that while it was possible to run such an engine without any other ignition means, the engine performed very much better if pilot oil injection was also used."

When the possibility of supplying a high-pressure injection compressor was considered, together with the regular Diesel fuel oil injection means, Cooper-Bessemer decided that the design would not appeal commercially and, at least for the time being, should not be produced.

As stated above, the possibility of allowing the gas to go in with the intake air was discarded because of the assumption that it would pre-ignite. Actually, it is a bit difficult to get gas to ignite at 400 pounds compression, even if in a perfect mixture ratio, although one cannot be sure it will not ignite.

Undoubtedly, one reason for the Otto cycle engine being limited so low in compression is the existence of hot spots in the combustion chamber. Theoretically, at least, the temperature of ignition of a perfect mixture of natural gas and air is above the temperature reached with 400 pounds compression. There is, of course, a minimum gas-air ratio below which the mixture is not inflammable under atmospheric conditions, even when ignited with a spark, and also a maximum beyond which it will not ignite.

The point that was not considered in the earliest work on burning gas on the Diesel cycle was that due to the inherent efficiency of that cycle the amount of gas required is considerably less than with the Otto cycle and the gas-air ratio at full load is still a very lean mixture, not too easily ignited.

It was, therefore, found possible to admit the gas with the engine air intake and still be completely free of any evidence of premature ignition. In fact, on very heavy overloads with natural gas, the mixture will not fire without a pilot oil flame. It is, of course, possible to employ electrical ignition with this high compression, but electrical ignition under these conditions is not too reliable and the engine really requires a more positive flame than can be provided electrically. Still further, the desirability of having an engine which can operate on either oil or gas makes the pilot oil ignition attractive.

It is obvious from the above that any engine built as a Diesel can be fitted to operate on gas, although engines built purely as spark-ignited gas engines cannot be converted to this principle.

Assuming a Diesel oil engine in operation and on load, if gas is admitted in the intake air the governor obviously will immediately reduce the amount of oil to compensate for the percentage being car-

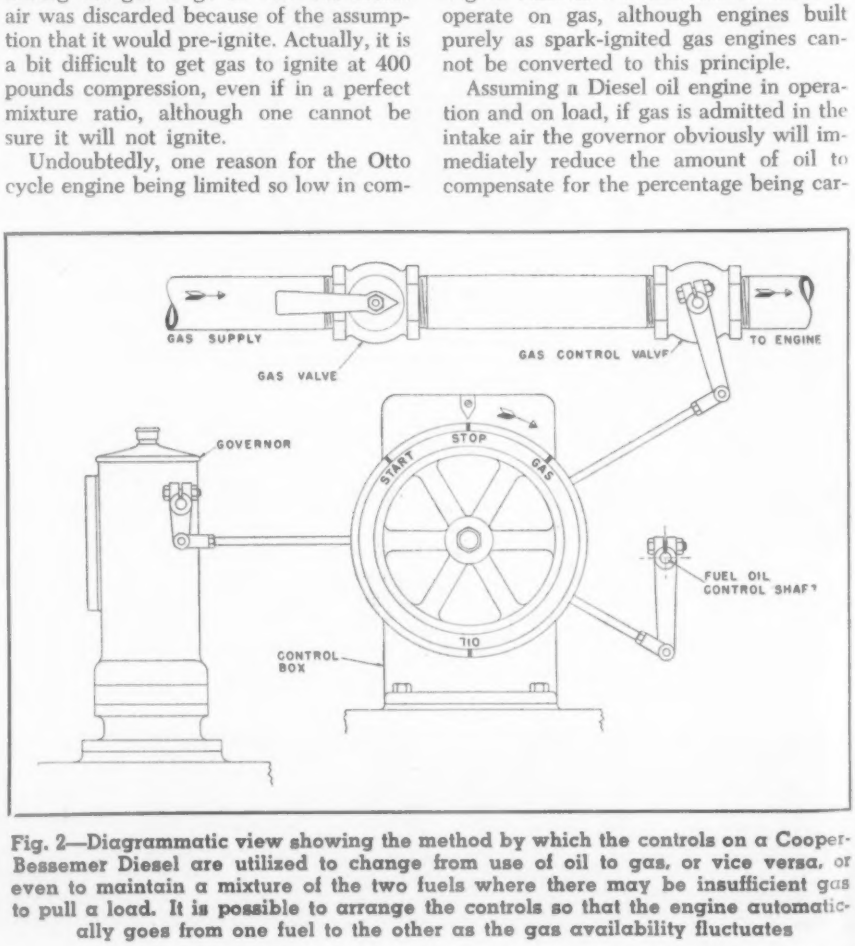

Fig. 2—Diagrammatic view showing the method by which the controls on a Cooper-Bessemer Diesel are utilized to change from use of oil to gas, or vice versa, or even to maintain a mixture of the two fuels where there may be insufficient gas to pull a load. It is possible to arrange the controls so that the engine automatically goes from one fuel to the other as the gas availability fluctuates

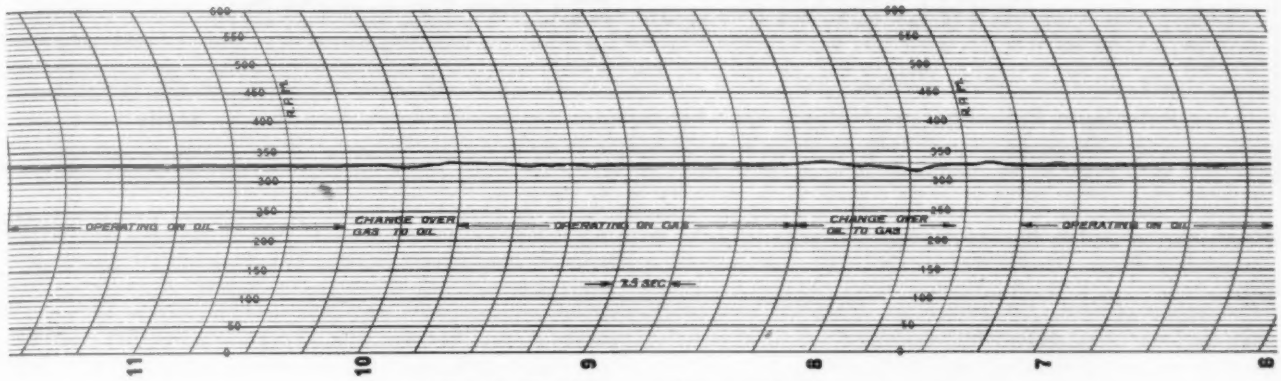

Fig. 3—Check on engine speed of a dual-fuel Diesel switching from oil to gas and back again while operating at 327 rpm and full load of 500 HP. The total variation in engine speed was only 15 rpm (4.60%) when changing from oil to gas, and 6 rpm (1.84%) when changing from gas to oil

ried by the gas. It then merely becomes necessary to reduce the fuel oil injection to the desired minimum and then govern the percentage of gas according to load. To convert the oil engine to the gas engine, therefore, it is necessary to remove the fuel oil system from the governor, set it in the minimum position and connect the governor to the gas regulating valve. This is an extremely simple move and requires not more than a few minutes.

In the normal case, a shutdown of a few minutes to make this conversion would not be of any consequence. There are cases where the gas availability varies frequently, however, as in refinery operations. In such cases it is desired to be able to instantly change from oil to gas, or vice versa, or even to maintain a mixture of the two where there is insufficient gas to pull the load. To do this obviously requires some form of controls so that the operator can at will change from one fuel to the other, or even arrange it so that the engine automatically goes from one to the other as the gas availability fluctuates. Such controls are illustrated diagrammatically in Fig. 2.

There are hundreds of installations of Diesel engines, or of gas engines, which have been installed as convertible units, because of the uncertainty of the future of the particular fuel they are using. This is particularly true, of course, when installing an engine in a gas field of questionable future. The usual means of convertibility is by change of pistons, or of cylinder heads, or by means of spacers under the cylinder heads which will increase compression space when converting to gas. The conversion then consists of changing from an electrical ignition system to a fuel oil system or vice versa. The change obviously requires considerable time and involves expensive parts.

Worthington

The Worthington dual-fuel engine is similarly able to burn either gas or oil or any mixture of both.

When operating as a gas engine, the system employs pilot oil ignition, eliminating completely any need for electrical ignition with its accompanying hazards and many times troublesome operation.

This pilot fuel can be used in amounts as low as 5% of the total full load Btu requirements of the engine, and the fuel mixture can be varied using any proportion of oil and gas from 5% oil and 95% gas to operation on fuel oil only. This mixture may be adjusted manually or an automatic adjustment can be provided to vary the mixture as the gas holder level changes or as the fuel gas supply pressure varies.

When operating as a straight gas engine, the governor acts on the gas fuel supply only, the pilot fuel supply remaining constant regardless of load conditions. Approximately one-half of the no-load fuel requirement is supplied by the pilot oil.

When the rate of gas consumption should remain constant, all load fluctuations are provided for by governor action on the fuel oil supply. In applications where the gas supply may not be sufficient for full time operation as a gas engine, or where the gas supply is a variable factor, the system can be arranged so that the governor will call for all the gas available, the remainder of the load being automatically provided for by varying the amount of fuel oil supplied.

The unit is instantly convertible from gas to oil or oil to gas operation by a single revolution of one control wheel. If the gas supply should fail unexpectedly this conversion is automatically accomplished by the governor action. The expense of conversion parts and the loss of time attendant to the conventional conversion by changing compression ratios are eliminated.

With the dual-fuel system the conversion is accomplished instantly without shutting down the engine or dropping the load. The speed change is negligible and full speed recovery is accomplished in a matter of seconds only. (See Fig. 3).

The Worthington dual fuel system does not require a high pressure fuel gas supply, operating with a fuel supply at pressures as low as two inches of water. Thus any need for high pressure gas compression equipment is eliminated. This is a highly desirable feature as high pressure gas handling equipment is expensive, difficult to maintain, and always presents a definite fire and explosion hazard.

The unit operates on the full Diesel cycle regardless of the fuel being used and maintains full Diesel engine economy whether operating on gas or oil fuel. Fuel consumption as a gas engine is as much as 20% more favorable than that of a similar engine operating on the conventional spark ignition Otto cycle.

Applications of dual-fuel Diesel engines are seen in refinery operations, to provide some use for the dry gases produced in refining and cracking operations. Gas engines are, of course, the logical solution to this problem. However, during initial starting, and at times during the process cycle, there may not be sufficient gas available to operate all of the gas engine capacity which would normally be installed. In a case of this kind the dual-fuel engine may be the efficient solution.

ADVERTISERS' INDEX

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Alcorn Combustion Co. R-362
American Cyanamid & Chemical Corp. R-335
Aluminum Co. of America R-347
American Meter Co. R-340-R-341
Attapulgus Clay Co. R-383
Badger & Sons Co., E. B. R-360-R-361
Beaird Co., J. B. R-355
Bechtel-McCone Corp. R-395
Brooks Equipment & Mfg. Co. R-392
Brown Instrument Co. R-349
Consolidated Engineering Corp. R-387
Dowell, Inc. R-377
Emery Industries, Inc. R-353
Ethyl Corp. R-322
Filtrol Corp. R-343
Foster Wheeler Corp. ..... Insert
General Chemical Co. ..... Inside Back Cover
Graver Tank & Mfg. Co., Inc. R-371
Harshaw Chemical Co. R-375
Houdry Process Corp. R-345
Hudson Engineering Corp. Inside Front Cover
Jones & Laughlin Supply Co. R-385
McKee & Co., Arthur G. R-369
National Petroleum News R-378-R-391
Owens-Corning Fiberglas Corp. R-365
Petroleum Rectifying Co. R-381
Porocel Corp. R-339
Powell Co., Wm. R-397
Sun Shipbuilding & Dry Dock Corp. R-357
Texaco Development Corp. R-332
Union Asbestos & Rubber Co. R-351
Universal Oil Products Co. R-331
Wyatt Metal & Boiler Works ..... Outside Back Cover
Zink Burner Co., John R-388

WIDENING HORIZONS

Views on Personnel, Management and Economic as Well as Technological Developments in Petroleum Refining and Natural Gas Processing: Comment from Readers Is Invited

Postwar Fuels for Prewar Cars

DATA which has recently come to hand showing the large numbers of aged cars that will be driven for some years after the war emphasizes the importance of refiners considering their fuel requirements, as well as those of the new cars which will be manufactured.

More than two-thirds of the passenger models on the road today are 1939 models or earlier, it has been brought out in a survey made by R. L. Polk & Co. for 23 states. While these states have only about 20% of the country's registrations, it is not considered likely that the ratio of the different age groups will be materially changed when the survey of the entire country is completed.

The Business Bulletin of the Cleveland Trust Co. also brings out in a recent article the large proportion of old model cars being driven today. In 1937, it says, when there were about 23,500,000 passenger cars in use, about 35% had been in use less than two and a half years and were classified as "young" cars. About 36% had been in use from two and a half to seven and a half years and were represented as being "middle aged". The remaining 29% had been in operation for more than seven and a half years and were classified as "ancient".

Today the Bulletin estimates there are about 22,000,000 passenger cars in use. There are no "young" cars which have been in use less than two and a half years. The "middle aged" cars, those in use from two and a half to seven and a half years, have increased to 49% of the cars in use today, and the "ancient" cars have increased to 51%.

Various authorities also agree that these old cars will be kept in use for several years after the war if necessary, until the car manufacturers can catch up with the demand and replace them with new models, instead of being scrapped in large numbers, as was believed likely early in the war. Car owners used to scrap their cars mainly because they could buy a later model. When it is a matter of driving an old car or no car at all, and particularly when the time comes when repair parts and services will be generally available, it is believed the old cars will be kept on the road for a much longer time than had earlier been estimated possible.

These conditions bring up the question of what sort of motor fuel refiners will supply for these old cars in the immediate postwar years. There has been much discussion of postwar motor fuels in terms of what the new cars will require. Some authorities believe premium grade fuel will run 85 octane number or higher by ASTM Motor method, regular will be 75-77 octane rating and a third grade if put out would be around 70 octane.

In 1937 the motor fuels which were being marketed and gave satisfactory performance in the cars of that period, according to the U.S. Bureau of Mines annual motor fuel survey, ran 76-80 octane number for premium grade, Motor method, 64-70 regular grade and 50-65 for third grade.

Since a large number of cars which will be driven at the close of the war will be models which were designed to operate on fuels supplied in 1937, the proposed standards for the new regular and premium grade postwar fuels would seem to be above their needs, by both economic and actual engine requirements. The proposed 70-octane third grade gasoline would meet the highest anti-knock standard of regular grade marketed in 1937. It is said such a gasoline could be made for a cent a gallon less cost than the higher anti-knock grades which are proposed. Some refiners are now considering what type of postwar gasoline to market for the middle-aged and ancient cars which will be driven for some years, whether it is called third-grade or some other name.

Contribution to Conservation

THE U. S. Bureau of Mines has done the oil industry a real service in its report recently made public on evaporation losses from aviation gasoline in standing storage (See pg. R-252, April 4, 1945, and pg. R-373, May 2, 1945, NPN Technical Section). There has been but little published data on this subject available to the oil companies. Consequently, what are actually losses incurred in handling gasoline too often are attributed to evaporation and thus, indirectly at least, classified as an act of Providence and something the oil company cannot help.

The results of the Bureau of Mines tests on blended gasoline and isooctane and neohexane, aviation gasoline components, in seven 50,000-bbl. tanks on an oil company tank farm in the Texas Panhandle, show actual losses due to evaporation covering periods of four to six months. Even in cone tanks equipped with vapor-vent valves the loss over these periods was under one per cent. With breather-roof tanks the loss was only a small fraction of one per cent. No appreciable change in fuel characteristics was shown, although there was a slight increase in distillation temperatures from the initial to the 20% point.

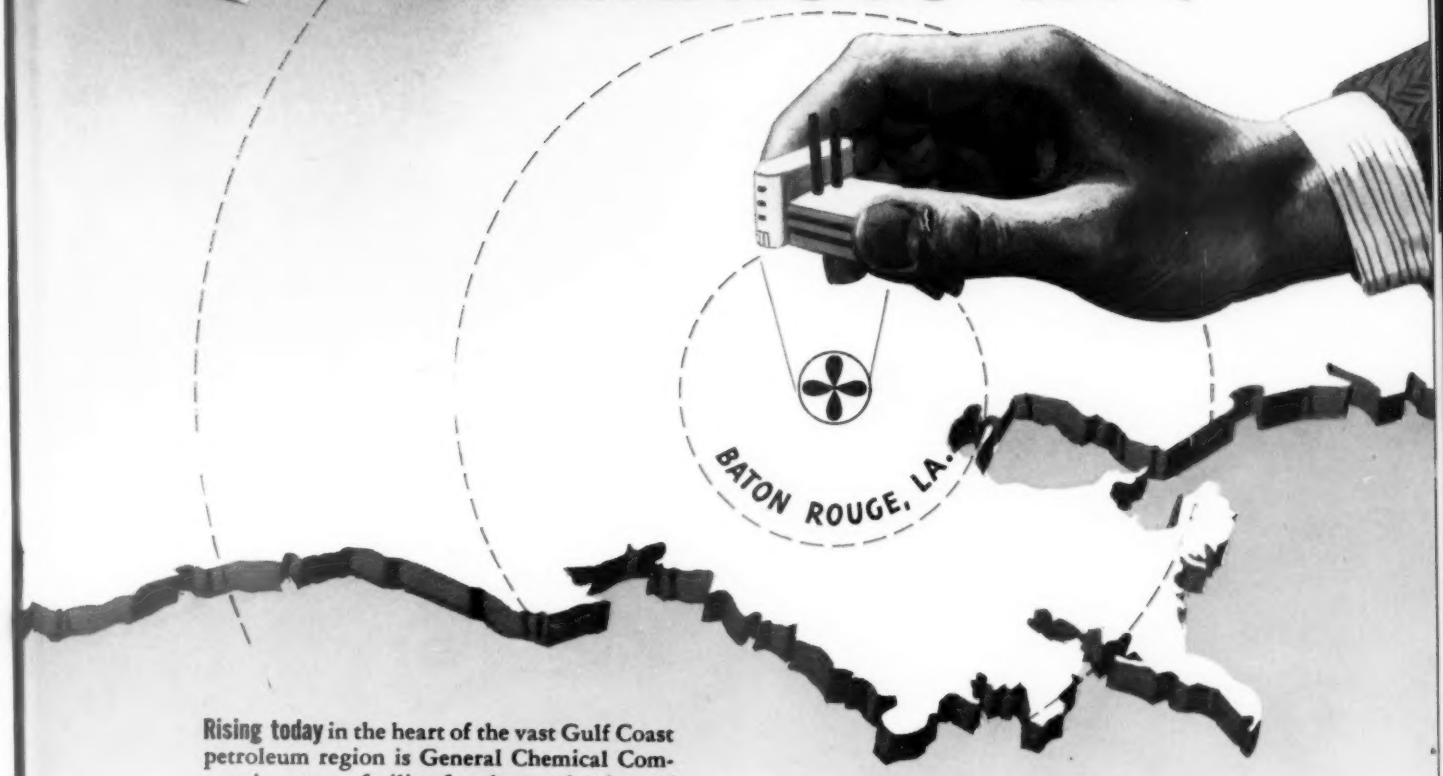
Reference to some of the early investigations by the Bureau of Mines in this field shows the great improvements that have been achieved in the manufacture of tanks and fittings to provide a type of storage that has for practical purposes almost eliminated losses of volatile products in storage from evaporation.

In the summer of 1925, Ludwig Schmidt, an engineer on the Bureau's staff, made a study of evaporation losses throughout the refinery, covering a number of plants in the Mid-Continent field. This was the first comprehensive study on this subject for the petroleum industry. (NPN, Dec. 16, 1925; Dec. 30, 1925; Jan. 6, 1926) The total average loss from the various phases of storage and handling in a refinery was placed by this investigator at 6.3%, of which loss in storage was 2.5%. Other losses making up the total were 1.8% loss in rundown tanks; 0.5% loss in treating; 0.5% loss in filling tank cars; 1.0% loss in miscellaneous handling. The tests indicated, said the report, that a good share of the overall losses which refiners at that time were experiencing in plant operations might be accounted for by evaporation losses.

By the continuous improvement of their equipment to its present high degree of efficiency, the tank and fittings manufacturers have made a valuable contribution to the conservation of the most valuable components of crude oil.

GENERAL CHEMICAL COMPANY

Creates New Facilities for ANHYDROUS HF!



Rising today in the heart of the vast Gulf Coast petroleum region is General Chemical Company's newest facility for the production of Anhydrous Hydrofluoric Acid.

With Baton Rouge Works, American Industry has at its command another strategic source of supply for this vital raw material . . . General Chemical's other Anhydrous HF plants are already serving requirements of East, West Coast and Mid-Continent industrial centers.

As a pioneer producer of this new chemical tool, General Chemical has conducted intensive research on the product's applications as well as physical and chemical properties. The data which have been developed are now being released to Industry in the publication outlined below. Undoubtedly it will prove invaluable to those exploring the potentialities of Anhydrous HF for their processes.

NEW TECHNICAL BULLETIN

General Chemical Technical Service Bulletin No. 30A "Anhydrous and Aqueous Hydrofluoric Acid." Twenty-four pages containing new and exclusive data, curves, charts, extensive bibliography, etc. Available from General Chemical Company, Fluorine Division, 40 Rector Street, New York 6, N. Y., or from the nearest General Chemical Sales and Technical Service Office. Please use your business letterhead when writing for your copy.

BASIC CHEMICALS

GENERAL CHEMICAL COMPANY

FOR AMERICAN INDUSTRY

GENERAL CHEMICAL COMPANY

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